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About Our CONTRIBUTORS

WILLIAM A. COLBURN, D.D.S. is an old hand at writing articles on denture construction and roentgenography of the type that are quickly translated into practice. His last publication with us (in which C. P. REMY, dental technician, likewise cooperated) was in July, 1940: AN ACCURATE POST-VALVE SEAL FOR MAXILLARY DENTURES.

WALTER HAROLD PHILLIPS, D.D.S. (University of Michigan, 1928; M. S., 1935) and HAROLD A. MAXMEN, D. D. S. (University of Detroit, 1936; Ph. C. and B. S. in bacteriology, 1932: Wayne University) have as co-authors previously written on the subject of dentistry for children, although they are newcomers to THE DIGEST. Doctor Maxmen specializes in dentistry for children and Doctor Phillips in oral surgery and public health. He has been supervisor and instructor in surgery for the Children's Fund of Michigan and is the director of the Dental Division of the Department of Health of the City of Detroit.

ALBERT E. BONNELL, JR., D.D.S. writes to us: "Any credit for this roentgenographic report is my father's and not mine. I just picked up and carried through where he was forced to stop. My father, incidentally, was the first dentist to locate in what is now the state of Oklahoma, coming to Muskogee, Indian Territory in 1888. He was one of the organizers of the Oklahoma State Dental Society and was later its president and in 1930 was a vice-president of the American Dental Association."

TRAVIS E. KALLENBACH, D.D.S. is a graduate of the Chicago College of Dental Surgery of the class of 1926. He has previously written for the dental literature on technical subjects and in ORAL HYGIENE (September, 1940) described his adventure in FLYING OVER CENTRAL AMERICA. Although a general practitioner, Doctor Kallenbach's major interest for twelve years has been in the field of temporomandibular articulation, about which there is no end of confusion among physicians and dentists alike. It is hoped that the series of articles to be presented in THE DIGEST and introduced by the FACTORS IN CORRECTING JAW POSITION RELATIVE TO THE ABNORMAL TEMPOROMANDIBULAR JOINT in this issue will prove to be a source of clarification. The color plate accompanying the present article was specifically prepared for us by the medical artist Angela Bartenbach.

ALLISON HARTER MILLER, D.D.S. (University of Pennsylvania, 1923) is an oral surgeon who in ELASTIC TRACTION IN FRACTURE FIXATION offers a simple and important war-timely method.

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Effect and Control of Directional Force in the Arrangement of Artificial Teeth

WILLIAM A. COLBURN, D.D.S. and C. P. REMY, San Francisco

DIGEST

1. A violation of the dictates of directional force in arranging artificial teeth will create proportionately the same difficulty and symptoms as a protrusive centric error in the bite.

2. Temporary retention should be attributed to a violation of the requirements of directional force and stress in tooth arrangement, and not to the impression technique or processing.

3. Relining or rebasing is never indicated or advised as it will not correct lost retention, either recent or delayed, if the directional forces are unfavorable.

4. The height of the mandibular incisors is the guide or fixed point in beginning the development of the esthetics, vertical dimension, molar and bicuspid positions of a complete maxillary and mandibular tooth arrangement.

PROBABLY NO BASIC principle in denture construction is more abused, misused or misunderstood than the effect and control of directional force or stress in the arrangement of artificial teeth—abused by those who recognize this important principle only by the catchy and overworked phrase, "traumatic occlusion," and misused by the majority by simply ignoring or eliminating directional stress in their procedure. The first group recognize the principle of directional force as the cause of alveolar bone absorption, especially in the anterior part of the mouth, but rarely mention that the same force (traumatic occlusion) would cause the posterior ridges to absorb. Moreover, if the anterior ridge absorbed under a denture that was in harmony with directional force and occlusion, Nature would fill the space with soft tissue to eliminate the space or vacuum; likewise, if the soft tissue were removed surgically and the space created by its removal allowed to remain, Nature would again fill the gap with soft tissue as before. Another exception to the traumatic theory and its concept of ridge absorption as the cause of lost retention is this:

Alveolar bone absorbs under tooth-bearing ridges and the space may fill with soft tissue just the same as it does under baseplates. (It should also be remembered that surgerized soft tissue will reform if the underlying serrated alveolar bone is not filed

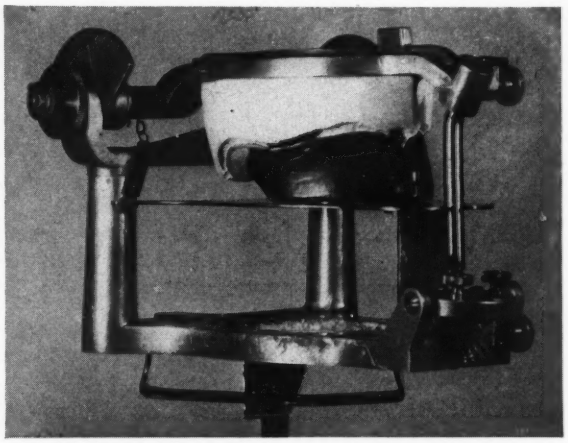


Fig. 1

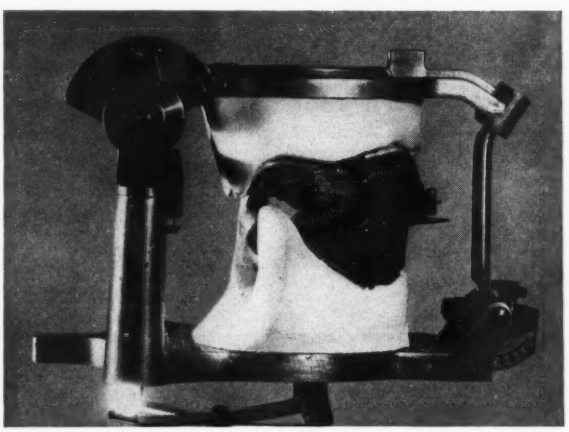


Fig. 2

TECHNIQUE

Step 1:

Figs. 1 and 2—Attaching cast to articulator.

Separate the bite-blocks; place the maxillary bite-block on the occlusal plane table with the labial arc at the apex of the Bonwill triangle and attach to the upper bow of the articulator with plaster. Remove the table; replace the mandibular cast on the maxillary plane and fasten with sticky wax; turn the articulator upside down and attach the mandibular cast to the bow of the instrument.

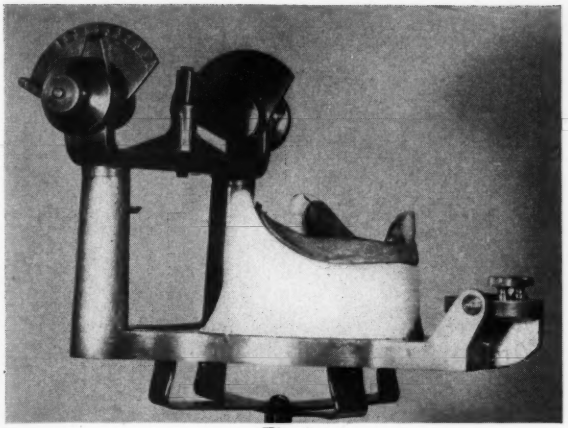


Fig. 3

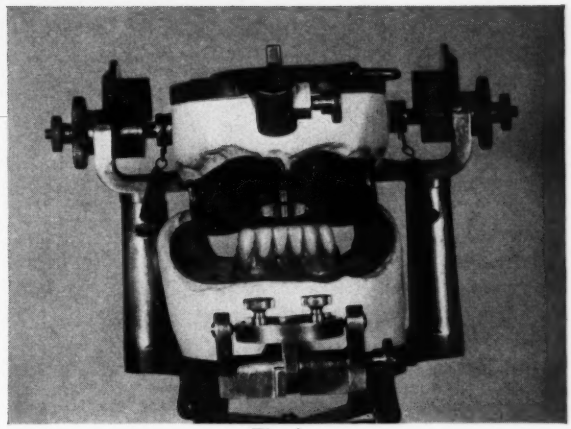


Fig. 4

Step 2:

Figs. 3 and 4—Arranging the anterior teeth. Beginning with the central incisors, right or left, the anterior six mandibular teeth are set so that their long axes are parallel to the center line located on the maxillary bite-block, their necks are over the ridge, and their incisal edges are in contact with the maxillary bite-block.

smooth or removed.) As to trauma on natural teeth, probably no better exception to the accepted theory of bone absorption under stress could be mentioned than those cases wherein only two or three remaining teeth function for years without loosening.

In the studies of bone structure by Jansen,[1] Macewen[2] and Murray[3] there is agreement by all that "incisal pressure always leads to strengthening of the bone structure." As to trauma on natural teeth, in 1926 Robert Dunn stated that: "the lower incisors will invariably return (after having been released) to their typical vertical arrangement. And it is a singular fact that in the development of the dental apparatus the mandibular incisors are invariably normal in their vertical arrangement. They are intended as a guide or fixed point by Nature, in her process of vertical development in molar and premolar region."

Orthodontists use directional force to move the natural teeth into position and then retain them there until the force of occlusion is equalized. But the prosthodontists arrange the artificial teeth to perfect balance on an instrument and in twenty-four hours after the dentures are in the mouth the directional force is changed (by settling) to a forward direction instead of against the maxillary ridge. If a favorable equalization occurs in the forward advance of the mandible (during the settling), it is possible for the case to move from a normal to an advanced prognathism without complaint from the wearer. When this

[1]Jansen, Murk: On Bone Formation, Manchester University Press, 1920.
[2]Macewen, William: Growth of Bone, Glasgow University Press, 1912.
[3]Murray, P. D. F.: Bones, Cambridge University Press, 1936.

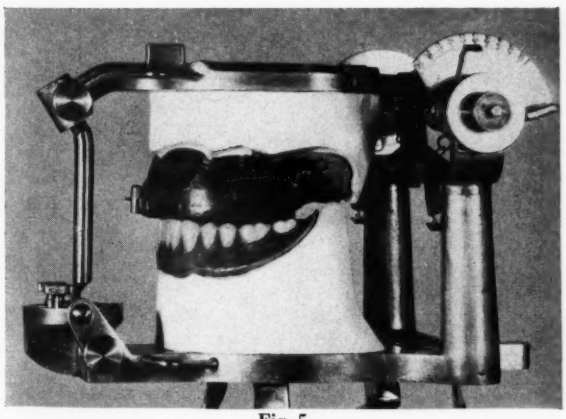


Fig. 5

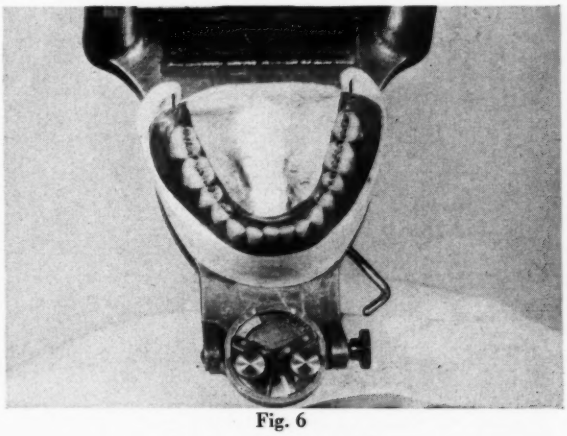


Fig. 6

Step 3:

Figs. 5 and 6—Arranging the mandibular posterior teeth.

The mandibular first bicuspids are set with their buccal cusps touching the maxillary bite-block and their long axes tipped slightly lingually; the second bicuspids are set so that their buccal cusps are 1 mm. from the maxillary plane and the lingual cusps 1.5 mm; the first molars are arranged so that the mesio-buccal cusps are 1.5 mm. from the maxillary bite-block, the disto-buccal cusps 1 mm., the mesio-lingual cusps 2 mm., and the disto-lingual cusps should clear the plane by 1.5 mm. The second molars should continue the curve established by the first molars and also the curve of the mandible. This arrangement produces a curve of Spee simulating the Gysi average for the 33 degree teeth, and should be modified slightly for the 20 degree posteriors.

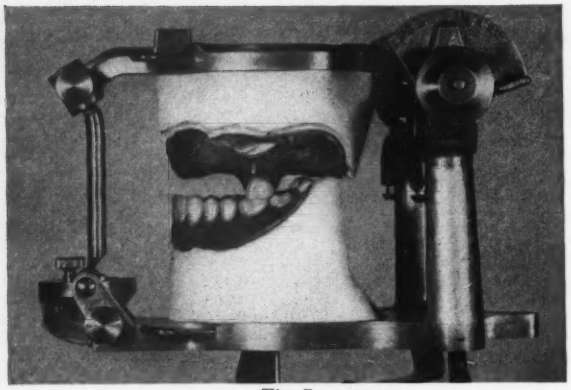


Fig. 7

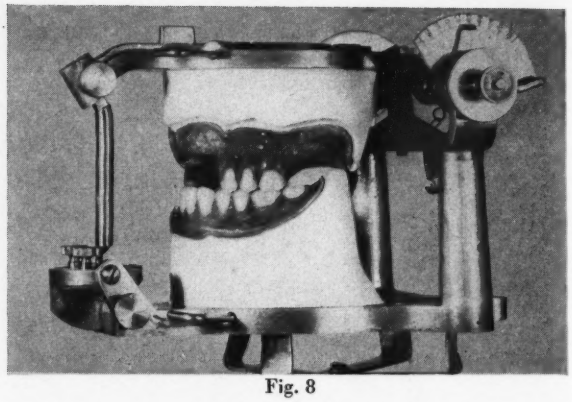


Fig. 8

Step 4:

Fig. 7—Arranging the maxillary molars.

The maxillary first molars are arranged to their correct centric, working, and balancing positions by slight grinding or changing the formula of the mandibular plane to correspond to the condylar and incisive guidances of the articulator. The maxillary second molars are placed in functional occlusion with the mandibular molars by a like procedure after the bicuspids are in their functional positions.

Step 5:

Fig. 8—Arranging the maxillary bicuspids.

The maxillary bicuspids are arranged and adjusted to functional movements the same as the first molars except that they are placed 1 mm. anterior to the true centric position. This 1 mm. space between the maxillary first bicuspids and the mandibular second bicuspids, and the maxillary second bicuspids and the mandibular first molars permits the case to settle without an anterior drive against the maxillary denture by the lower second bicuspids and first molars. Excessive grinding of the bicuspids is eliminated but the molars, owing to their greater bulk of porcelain, can be ground to meet the needs of directional force without noticeable changes in their anatomic carvings.

equalization of directional force and harmony of cusps does not happen, the maxillary case will drop or feel loose in front (a temporary fit) and, although the denture may start to loosen in a day or several months, the cause of the difficulty will invariably be attributed to the impression technique, error in processing, or absorption of the alveolar bone. Lining or rebasing is recommended and attempted with the usual result that the relined and reprocessed denture is not so comfortable nor does it have so much retention as the original case. This failure is unquestionably caused by the compressing and distorting of the soft palatal tissue by the trapped air and lining material in a tight-fitting baseplate, and the repositioning of the lined denture downward and forward, increasing the former unfavorable anterior directional thrust of the posterior teeth.

It is obvious that the mysterious cause of temporary retention of a maxillary denture should not be attributed to the impression technique, processing, or alveolar absorption, but the solution should be approached from the anatomic features of the posterior teeth and their proper arrangement according to the dictates of directional force or stress. To be more explicit: The forty-five degree

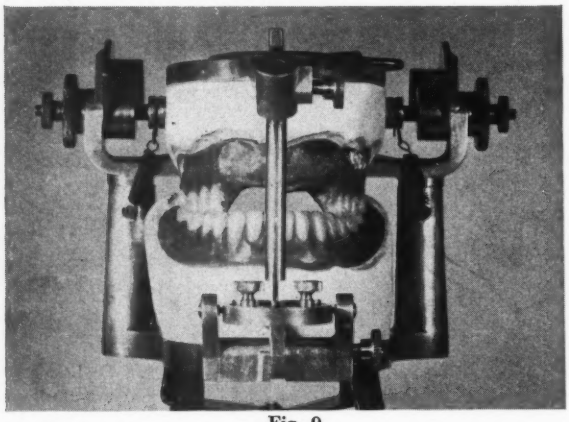


Fig. 9

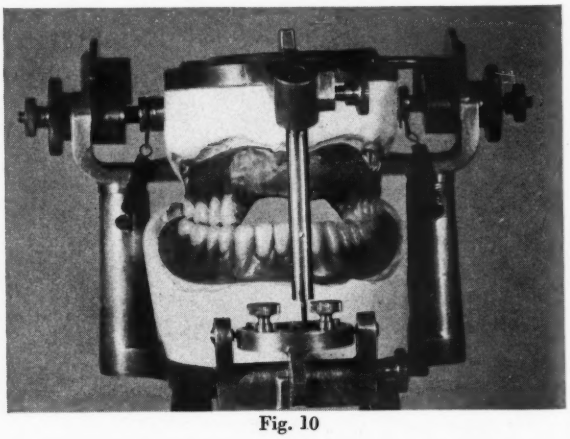


Fig. 10

Step 6:

Figs. 9 and 10—Completed arrangement of the bicuspids and molars.

The completed arrangement of the bicuspids and molars resembles the frustum of a pyramid, when the articulator is in centric position. The mechanical advantage is that the line of force of the mandibular stroke against the maxilla is directed toward the apex of the pyramid, not only in centric but also in the working and balancing positions.

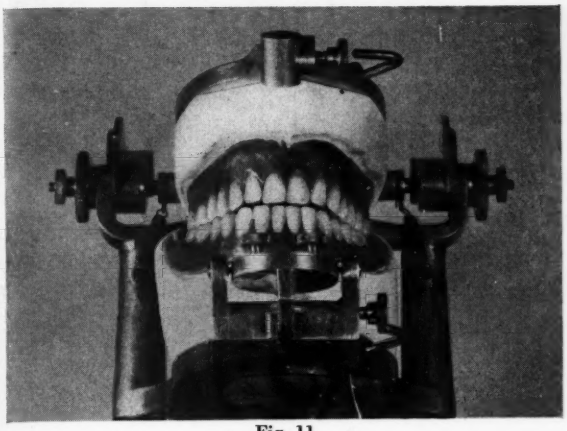


Fig. 11

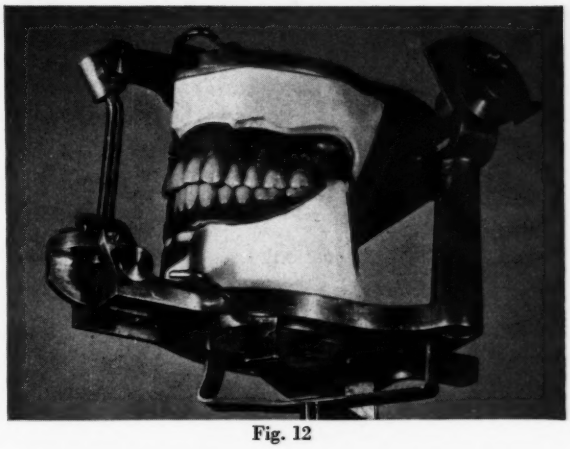


Fig. 12

Step 7:

Figs. 11 and 12—Arranging the maxillary anterior teeth.

The six anterior teeth are arranged in variable relations to one another to fulfill the esthetic requirements and still come within the positional limits as to the overbite, overjet, settling of the dentures, or change in the vertical dimension by occlusal grinding.

posteriors are difficult to arrange and maintain in favorable function, as the settling of the denture soon, if not immediately, changes the directional force from centric (favoring a posterior directional stress) to a decided anterior direction which is unfavorable for continued stability. Another extreme is the cuspless posteriors which permit such a slight control of directional force that, if the denture does not loosen, the mandible is likely to wander and habitually remain forward, resulting in an unwelcome facial expression. (This roving of the mandible proves conclusively that incline planes and cusps are and should be recognized as a guiding factor in mandibular movements, and in plain-line construction especially, should be considered as important as the registration of the condylar paths in anatomic arrangements.) The conventional, or thirty-three degree posteriors, are much less difficult to arrange than the forty-five degree posteriors and they and the twenty degree posteriors, set to the mandibular anatomic ridge relations and in accord with the dictates of directional force and stress, will maintain the stability, function and comfort of a

(*Continued on page 72*)

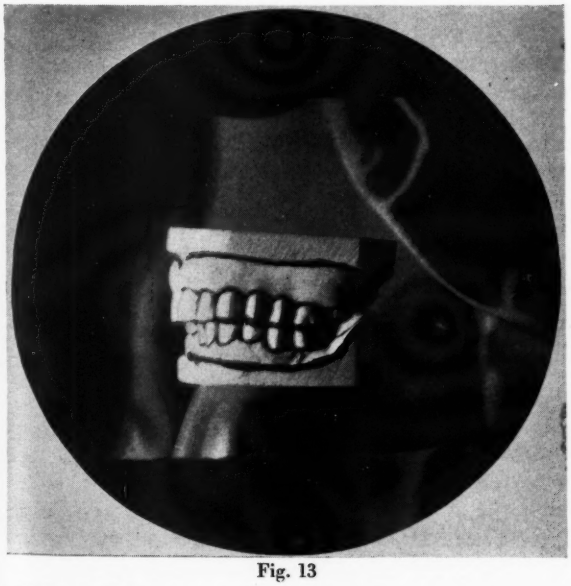


Fig. 13

Incorrect Result:

Fig. 13—Maxillary denture with incorrect vertical and overbite; teeth arranged tooth-to-tooth, beginning with the incisors; no control of directional force; no stability and poor esthetics.

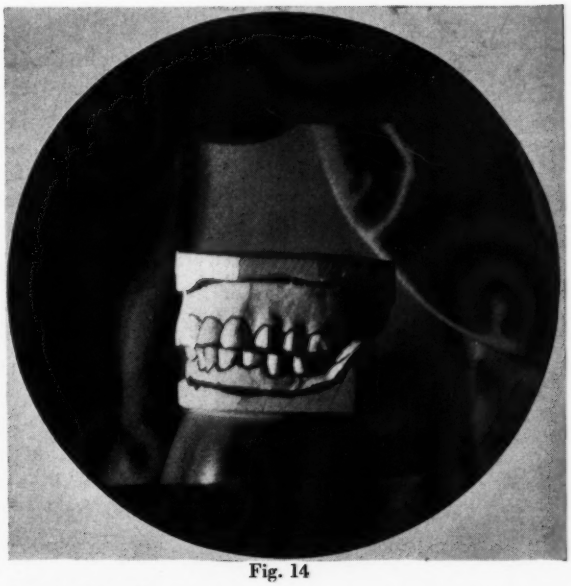


Fig. 14

Correct Result:

Fig. 14—Same case with corrected vertical and overbite; bicuspids and molars arranged according to directional force and occlusion; anterior teeth arranged last; good stability and esthetics.

A Practical Root Resection Technique for Young Permanent Anterior Teeth*

WALTER A. PHILLIPS, D.D.S., M.S., and HAROLD A. MAXMEN, B.S., PH.C., D.D.S., Detroit

THE COST OF DENTAL operations is one of the more important deterrents to greater public utilization of dental treatment, particularly for children. The more applicable to the public that procedures can be made, the larger will the portion of the population be who will seek dental service. Too many cannot afford dentistry as it is now practiced. Mindful of this fact, we have developed a simplified economical technique for root surgery in which, although periapically infected, the permanent anterior teeth of children are conserved.

Permanent anterior teeth with decomposed pulps and infected root canals in the mouths of children present a difficult problem to the dentist. In such teeth an area of bone destruction around the apex is almost always found on roentgenographic examination. Three questions arise: (1) Should an attempt be made to save such teeth? (2) What are the chances for success if apicoectomy is employed? (3) Can the cost of such treatment be brought within the reach of the budget of the average family?

Regarding the first question (Should an attempt be made to save such teeth?) Kronfeld[1] said, "Microscopic findings justify such an attempt. . . . The difficulty in treating teeth with decomposed pulps seems to be failure to get complete access to all parts of the root canal and to the diseased area beyond the apex. . . . In pulpless infected teeth, inaccessible parts, such as ramifications and curved canals, continue to act as a source of infection, making healing of the periapical region impossible." Root resections help solve the difficulty presented in treating these teeth.

The answer to the second question (What are the chances for success if apicoectomy is employed?) is based on the experience gained in performing more than six hundred root resections for children ranging from 7 years to 18 years of age. Our experience indicates that approximately 99 per cent of periapically infected permanent anterior teeth of children can be saved by root surgery if the technique to be presented is carefully followed.

Regarding the third question, dealing with the cost of such treatment, we have found that most periapically infected permanent anterior teeth of children can be successfully treated by means of root surgery at a cost within the budget of the average family, provided a technique is followed in which only two or three treatments are necessary to assure success. Such a technique is offered in the post-resection canal filling technique proposed in this article.

The conventional method of filling the canal before resection has been successfully employed in conserving periapically infected permanent anterior teeth of children; however, this method often requires a long drawn out series of root canal treatments before it is possible to get the canal dry enough for proper filling. We have always doubted the sterility of the periapical area even after repeated treatment with drugs and electromedication. Inasmuch as there is no reliable method at the present time of determining the sterility of the periapical area before filling the canal, we feel that filling the canal before resection is not good surgery, because of the danger of seepage from the periapical area.

DIGEST

Although the retention of pulpless teeth is still a debatable question there are many indications for the retention of such teeth, especially single-rooted permanent anterior teeth of children.

The post-resection canal filling technique presented here in step-by-step detail offers an economical means of safely retaining pulpless permanent anterior teeth which otherwise would have to be extracted.

The procedure suggested provides the essentials for successful root resections: complete surgical removal of all periapical necrotic tissue under aseptic conditions and the sterilization and hermetic sealing of the root canal.

The technique gains recommendation by the author because his experience indicates that bone regenerates normally in the periapical area within six months in approximately 99 per cent of periapically infected teeth that have been resected by this method; thus the life of the new tissue is not endangered when the focus of infection has been eliminated and the tooth may give useful service for many years.

Advantages

The post-resection canal filling technique of apicoectomy is considered better surgery by such authorities as Mead[2], Colton[3], and Feldman[4], and has been found to have several important advantages over the conventional method:

1. There is less danger of seepage

*From the Dental Division, Department of Health, City of Detroit.

[1]Kronfeld, Rudolph: Histopathology of the Teeth, Philadelphia, Lea & Febiger, 1933, pages 176-203.

[2]Mead, S. V.: Oral Surgery, St. Louis, The C. V. Mosby Company, 1934, pages 560-573.

[3]Colton, M. B.: A Simple Rational Root Canal Therapy Employed in Conjunction with Apical Resection and Curettage, J. A. D. A. 23:2128-2132 (November) 1936.

[4]Feldman, M. H.: Postoperative Canal Filling in Apicoectomy, DENTAL DIGEST, 40:285 (August) 1934.

Fig. 1—Preoperative roentgenogram of periapically infected upper central incisors. Note the size of the root canals.

of septic material at the time the root canal is filled, because the periapical reservoir of infection has been removed surgically.

2. Acute symptoms are less likely to follow the sealing of the root canal by gutta-percha when there is doubt about the sterility of the periapical area. Appleton[5] states, "Under no circumstances, except in anticipation of immediate root resection, should a root canal be filled while infection of the periapical tissue persists as shown by positive culture." Many times it is impossible and it would be impracticable to stop seepage from a chronic, long-standing and extensive periapical infection. Furthermore, it is difficult if not impossible to get two consecutive negative cultures even after prolonged therapy in these cases.

3. It has been found less expensive to resect the root first and then fill the canal, in chronic long-standing and extensive periapical infections than to resort to an extended series of root canal treatments of questionable value before resorting to surgery. Fewer visits, fewer treatments, and fewer roentgenograms are required in the post-resection canal filling technique.

4. Facilitated condensation of the gutta-percha root canal filling is had in teeth with badly curved roots or teeth with broken instruments in the canal.

5. The technique advocated here improves the prognosis of teeth with extensive periapical involvement. If the destruction of the periodontal membrane has progressed further than is disclosed by the roentgenogram and the retention of the tooth is endangered, the tooth can be extracted without having wasted valuable time in prolonged root canal treatment.

[5]Appleton, J. L. T.: Bacterial Infection, Philadelphia, Lea & Febiger, 1933, pages 525-533.

6. Apparently there is less trauma, less postoperative swelling and pain following apicoectomy. This is possibly due to the fact that no pressure is transmitted to the periapical area during the condensation of the root canal filling.

7. A negative culture is not required.

Step-by-Step Technique

First Visit of Patient with an Acute Infection—1. Take a roentgenogram of the tooth involved.

2. Open the pulp chamber on the lingual with a spade bur.

3. Carefully remove the pulp chamber and root canal contents with a broach.

4. Flush the canal with tri-chlor, using an old hypodermic syringe with the point of the needle cut off.

5. Apply electromedication using Churchill's iodine as the electrolyte. (Dosage: 30 milliampere minutes.) Leave the canal open from 24 to 48 hours, or until the tooth is comfortable. Electromedication increases the blood supply to the periapical area, thereby hastening phagocytosis and reducing inflammation.

6. Treat thereafter as a chronic case.

First Visit of Patient with Chronic Infection; Second Visit for Acute Cases—1. Take a roentgenogram of the tooth involved.

2. With an aseptic technique, open the root canal on the lingual surface of the tooth by means of a spade bur. Enlarge the opening on the lingual surface of the crown until it will admit a number 6 round bur.

3. Remove the contents of the pulp chamber and canal with broaches, reamers, and files.

4. Flush the canal with tri-chlor.

5. Enlarge the apical foramen with reamers and files.

6. Apply electromedication, using Churchill's iodine as an electrolyte. (Dosage: 30 milliampere minutes.) Place an absorbent point saturated with formocresol into the canal and seal with zinc oxide and eugenol cement.

Second Visit for Chronic Cases; Third Visit for Acute Cases—1. The operator should have before him the clear and accurate roentgenogram, taken during the previous visit of the patient. The roentgenogram, however, cannot be relied on to disclose the entire extent of the periapical bone involvement. Invariably, the periapical bone destruction is more extensive than the roentgenogram would seem to indicate. A good roentgenogram does, however, show the length and position of the root and the proximity of adjacent roots (Fig. 1). Aseptic technique must be used throughout the operation.

2. Premedication will alleviate apprehension. Elixir of nembutal may be used for this purpose. (Dosage: One teaspoonful for each 5 years of age; i. e., 7½ years: 1½ teaspoonfuls; 10 years: 2 teaspoonfuls and so on.

3. Anesthetize completely the entire area to be included in the operation. Use a 2 per cent procaine solution with epinephrine 1:15,000 or a 1 per cent monocaine solution with epinephrine 1:15,000.

A. Maxillary Permanent Anterior Teeth: Subperiosteal injections are made on the labial surface over the entire length of the indicated incision. Deposit from 1 to 1.5 cc. Subperiosteal injections are made in the palate over the apexes of the teeth to be resected. Deposit from .25 cc. to .50 cc.

B. Mandibular Permanent Anterior Teeth: Bilateral mandibular block injections supplemented by subperiosteal labial infiltration is the method of choice for lower permanent anterior teeth.

4. Make a slightly curved incision, not less than 1 inch in length, through the mucoperiosteum to the bone. The incision is made incisally to

Fig. 2—Incision for resection of both upper central incisors requires an incision extending from cuspid to cuspid joining in the middle at the junction of the frenum and the gum.

Fig. 3—Use of periosteal elevator in retracting the flap during the cutting of windows through labial alveolar plate.

the point of resection as shown by the roentgenogram but not too near the gingival border as necrosis of this may occur. A fistula, if present, must be included in the flap. A long incision helps to prevent traumatizing the flap by eliminating tension of retraction at the corners. The frenum of the lips should not be cut. When both central incisors are being resected, the center of the incision is made at the junction of the frenum and the gum. A Bard-Parker blade number 15 is used in making this incision (Fig. 2).

5. A flap including the periosteum is freely dissected with a Hu-Friedy periosteal elevator number 10, exposing the labial alveolar bone over the roots to be resected. Holding the periosteal elevator in the left hand, retract the flap by placing one end of the elevator firmly against the labial alveolar bone above the operative area.

6. Apply adrenalin chloride 1:1000 on small squares (half inch) of sterile gauze to check hemorrhage. The gauze squares are placed under the flap and held for about two minutes under thumb pressure before removing. An aspirator is placed in the mouth at this point to remove excess saliva, medicaments, and blood.

7. The area of periapical necrosis is often apparent, because of the bulging, thinness or perforation of the overlying alveolar bone. A window is made through the overlying bone exposing fully the apexes of the roots to be resected, and the entire periapical necrotic area. A sterile Henahan surgical bur number 42 and sharp, double-end Hu-Friedy curets, numbers 10 and 11, are used to remove the overlying bone (Fig. 3).

8. Guided by the roentgenogram and a sterile explorer, determine the point of sound periodontal membrane for each root to be resected. Each root is amputated just below this point by means of a sterile cross-cut fissure bur number 559. The root is cut off with a flat or an oblique cut. An oblique cut is used only when the periodontal membrane is destroyed farther on one side of the root than on the other, and retention would be hindered by cutting the root flatly at the lowest point of healthy attachment.

9. Loosen the attachment of the granuloma or cyst from the walls of the bone cavity and dislodge the amputated root apex by means of the Hu-Friedy curet number 10. Remove in entirety the root apex and attached granuloma or cyst with a small sterile hemostat.

10. If the necrotic tissue lining the cavity is not removed intact, curet the remainder until the bone cavity is entirely free of all pathologic débris (Fig. 4).

11. Smooth the root-end and rough edges of the bone cavity with a sterile large round surgical bur and recheck the periodontal membrane around the periphery of the cut root with an explorer.

12. Flush the bone cavity with physiologic solution of sodium chloride.

13. Place a square of sterile gauze moistened with alcohol into the periapical bone cavity, and replace the flap temporarily.

Fig. 4—Upper central incisor roots resected and periapical necrotic tissue completely removed.

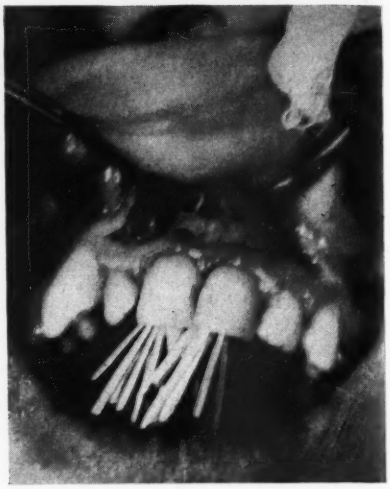


Fig. 5—Gutta-percha points protruding through amputated end of roots. Note also large number of gutta-percha points used in sealing each root canal. From 12 to 20 fine points are used for each canal.

14. Still using the sterile technique, remove the zinc oxide and eugenol cement filling on the lingual surface of the crown. Remove the absorbent point with a broach. Flush the canal with tri-chlor and dry.

15. Remove the alcohol sponge from the periapical bone cavity and replace it with another.

16. A sterile absorbent point moistened with phenol is used to sterilize the walls of the root canal. The alcohol sponge in the bone cavity catches any overflow of phenol from the canal.

17. The canal is wiped with 70 per cent alcohol on a sterile absorbent point and dried with another dry sterile point.

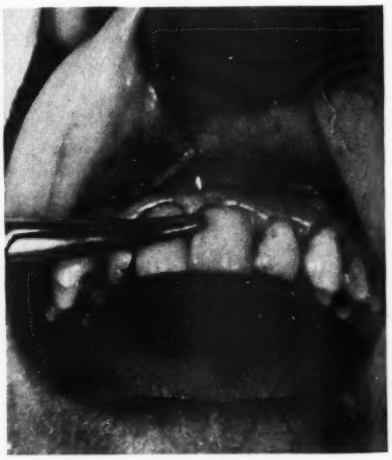


Fig. 6—First suture is placed at junction of frenum with the gum. This insures correct replacement of the flap. The suture must pass through the periosteum and include sufficient bulk of tissue to prevent cutting through.

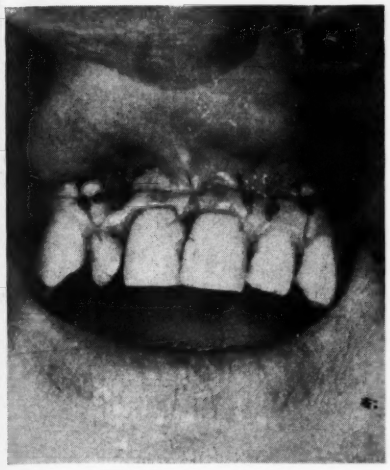


Fig. 7—Seven or eight interrupted derma-sutures usually suffice to hold the flap in place.

18. Select the largest size sterile gutta-percha point that will reach through the amputated end of the root. The selected gutta-percha point is lightly covered with a Kerr sealer, carried into the canal and forced into place under pressure with a Kerr number 1 spreader. Additional fine gutta-percha points are carried into the canal and condensed with the spreader until no more can be placed, thus producing a hard, dense core of gutta-percha, hermetically sealing the canal (Fig. 5).

19. The gutta-percha points are cut off even with the end of the root by means of a hot plastic instrument. A warm ball burnisher is used to compress the gutta-percha at the end of the cut root and thus insure a good seal. The gauze sponge in the periapical bone cavity is now removed.

20. Wash the bone cavity with boiled physiologic solution of sodium chloride, followed by 15 drops of fresh tri-chlor, followed again by the boiled physiologic solution of sodium chloride.

21. Examine the bone cavity for gutta-percha, Kerr sealer or bone débris.

22. Draw sufficient blood to fill the cavity by slightly irritating the surrounding soft tissue with a curet.

23. Replace the flap and suture using medium derma-sutures and a number 18 half round cutting edge surgical needle (Fig. 6).

24. A sufficient number of sutures must be placed to retain the flap in place securely. The sutures must pass through sufficient bulk of tissue including the periosteum to hold without cutting through (Fig. 7).

25. Remove the excess gutta-percha from the pulp chamber of the tooth and fill with oxyphosphate cement.

26. Take a roentgenogram of the area on which operation was performed (Fig. 8).

Postoperative Care

1. Advise the parent and child regarding the home care and the possibility of some swelling.

2. Prescribe an ice bag to the lips over the area operated on, during the first twenty-four hours to reduce swelling.

3. Remove the sutures at the end of ten days. Owing to muscle tension on the flap, the sutures are left in place longer than is customary for other operations about the mouth.

4. If an aseptic technique has been followed throughout, healing should take place without suppuration. Granulations gradually replace the clot and bone regeneration gradually replaces these.

5. If the blood clot breaks down, remove the sutures and pack the cavity with vaselined iodoform gauze. Remove and replace the dressing every forty-eight hours until the cavity is filled with granulations. Healing takes place by second intention.

6. Progress roentgenograms are taken every three months until regeneration of the periapical bone is complete. Check up roentgenograms should be taken once a year thereafter (Fig. 9 taken three months after operation; Fig. 10 taken six months after operation).

Summary and Conclusions

The cardinal principles essential for successful root resections include complete surgical removal of all periapical necrotic tissue, sterilizing and hermetically sealing the root canal, and the observance of aseptic technique.

Our experience indicates that bone regenerates normally in the periapical area within six months in approximately 99 per cent of periapically infected teeth which have been resected if the principles outlined are followed. According to Hill[6] who made a histologic study of resected teeth, the periodontal membrane regenerates over the root-end normally. His photomicrographs demonstrated: (1) no polymorphonuclear infiltration, (2) no epithelial rests, (3) no epithelial necrosis; consequently, the life of the new tissue is not endangered, and the tooth may be expected to give useful service for many years. The studies of Blum[7] and Coolidge[8], regarding the regeneration of bone and pericementum following a root resection correlate with the observations of Hill.

Although the retention of pulpless teeth is still a debatable question among dental authorities, there are, nevertheless, many indications for the retention of these teeth, especially single-rooted permanent anterior teeth of children. Inasmuch as

Fig. 8

Fig. 9

Fig. 10

Fig. 8—Roentgenogram taken immediately after operation has been completed to be sure that surgery and sealing of the root canals were thorough. Posts seen here and in Figs. 1, 9, and 10 are used to reinforce the silicate cement restorations placed in the crowns. These reinforced silicate cement restorations usually last from two to five years before it is necessary to replace them.
Fig. 9—Three months after operation showing progress of bone regeneration.
Fig. 10—Six months after operation showing complete regeneration of periapical bone.

[6]Hill, T. J.: Regeneration of Periodontal Membrane after Root Curettement, D. Cosmos 73:799-801 (August) 1931.
[7]Blum, Theodore: Root Amputation, J. A. D. A. 17:249-261 (February) 1930.
[8]Coolidge, Edgar: Root Resection as a Cure for Chronic Periapical Infection, J. A. D. A. 17:239-240 (February) 1930.

the extraction of a periapically infected permanent anterior tooth for a child creates a difficult and expensive replacement problem to be faced by the dentist and no substitute is as good as the child's own tooth, it is obvious that every means that modern dental science has made possible should be resorted to in order to retain the child's tooth, and at the same time to make the tooth innocuous as a potential focus of infection. Root resections give children a service frequently unequalled by any other measure available to the dentist. The post-resection canal filling technique is an economical means of saving pulpless permanent anterior teeth which otherwise would have to be extracted. It is a means of bringing a needed service within the reach of a larger number of children whose parents are unable to afford the more costly dental procedures now practiced.

3919 *John R. Street.*

Delayed Dentition

ALBERT E. BONNELL, Jr., D.D.S., Muskogee, Oklahoma

DIGEST

A roentgenographic developmental history of a lower left second bicuspid with an eight-year retarded eruption. The tooth erupted finally into functional occlusion under conservative treatment.

THE ACCOMPANYING SERIES of roentgenograms cover a seven-year period showing the development of a lower left second bicuspid.

Histologically these roentgenograms show the result of the physiologic activity of the odontoblasts, osteoclasts, and osteoblasts. The delayed dentition was eight years overdue but it did erupt with normal root and tooth development as well as supporting structures.

408 *Surety Building.*

Fig. 1—Lower left deciduous first bicuspid in position with first bicuspid in position underneath it. The patient was a boy, aged 10. The first permanent molar is banded, supporting a space retainer for the second bicuspid. The second bicuspid crown is in a horizontal position with its eruptive force apparently directed distally.
Figs. 2, 3, 4, and 5—Efforts to maintain space shown roentgenographically.
Fig. 6—Desired space having been obtained, it was maintained by use of a small cast bridge.
Figs. 6 through 10—Development progress of the bicuspid.
Fig. 11—Roentgenogram taken when patient complained of a feeling of "biting on something solid" when any pressure was put on the bridge.
Fig. 12—Bridge removed to allow bicuspid to erupt into occlusion.
Figs. 13 and 14—Further progress and development. Tooth is now in functional occlusion but position must be improved.

The Editor's Page

AN AWESOME-SOUNDING clinical entity is that condition known as the temporomandibular joint syndrome. Since the beginning of time, man's lower jaw has been swinging up and down and from side to side as he forms his words and prepares his food for swallowing. His lower jaw swings in a socket which is part of the skull. If the mechanism were not of this free-moving nature the constant pounding of the years would probably destroy the teeth completely and make serious intrusions of the condylar head into the temporal bone. Years of function produce wear of the dental parts. Under the pounding force of the lower jaw as it cuts like a cleaver and grinds like a mill against the fixed block, the millstone which is the upper jaw, the teeth are abraded. To extend the metaphor, the teeth, like the millstones, show the result of food preparation through the years.

Unlike the inanimate mill, the teeth are living parts with compensatory mechanisms. As the teeth wear, an adjustment is attempted to keep them in vital function. The teeth lose their vertical dimension; the condylar head in the glenoid fossa works downward and backward in the attempt to compensate for the change in the closing bite relationship. The face likewise shows the change. The vertical dimension is lost in the lower third because the "stops" that support the vertical relationships have been badly cut away. The lips and facial tissue that were draped over a framework of one dimension must make an adjustment to a reduced and contracted frame. Tissue cannot melt away or disappear. It must make some compensatory change in form. As a result of lost vertical dimension the lips roll out and protrude; the facial tissues that have lost some of their back wall of support lose tonus with the development of lines and wrinkles. The clean-cut jaw line of youth and health gives way to pouchy jowls and flabby tissues. All these changes come about because of alteration in the underlying foundation. No amount of external meddling or cosmetic camouflage will improve the face that has collapsed because of changes in the dental structures.

All the changes that come from loss of vertical dimension are not within the realm of esthetics. Some of the changes have serious physiologic implications. The condylar head as it works backward into the fossa can easily impinge upon sensory nerves and from this impingement can set up the neuralgias and the facial pains that are part of the temporomandibular joint syndrome. With the intrusion of the condylar head into the substance of the temporal bone, pressures can be built up in the auditory canal, from which minor hearing defects may readily develop. Impaired hearing, tinnitus, dizziness are symptoms that frequently are found as part of the temporomandibular joint syndrome, because of changes in the structures in the internal ear. Thus, the temporomandibular joint syndrome is one that affects the health, appearance, and comfort of human beings. The widely diffused symptoms and disturbances that make up this syndrome can be corrected only by a dentist.

To present to the dental profession the basic anatomy and physiology of the parts, one of the outstanding authorities in the field, Travis E. Kallenbach of St. Louis, begins in this issue a series of articles on the subject. Later on in the series, other men who have made pertinent observations in the study of the temporomandibular joint disturbances will add their reports.

The recognition and correction of the temporomandibular joint syndrome presents another opportunity to the dental profession. To help realize this opportunity the series of articles on the subject has been purposefully planned.

Factors in Correcting Jaw Position Relative to the Abnormal Temporomandibular Joint

(*First Installment*)

TRAVIS E. KALLENBACH, D.D.S., St. Louis

DIGEST

Purpose of Article: **To clarify some of the factors of rehabilitation which are frequently confused and which must be considered basic principles in instituting the technical and mechanical procedure of treatment in the correction of temporomandibular joint abnormalities.**

Definitions:
Anatomic conformation—This is the proper and normal relative state of those special structures and forces of the mouth, head, and face whose relationship to one another and proper coordination produce normal function. In the proper restoration and reconstruction of the teeth these structures and forces must be brought into harmony.

Abnormal articulation—This results from loss of harmony of the essential factors governing normal balanced function of the temporomandibular joint mechanisms. Proper correction depends on the correct reestablishment of normal balance by dental restoration.

Structures: **The normal anatomic structures of the temporomandibular joint are discussed and illustrated. These structures include: the mandibular fossa, the condyle head, the meniscus and joint cavities, the capsular ligament, the temporomandibular ligament, the sphenomandibular ligament, and the stylomandibular ligament.**

Function: **The movements of the normal anatomic articulation of the temporomandibular joint are outlined in detail. These movements are: (1) the opening or arc movement; (2) lateral, and (3) anteroposterior (forward and backward).**

Dysfunction: **The symptoms revealed in the abnormal articulation of the deformed joint are likewise outlined and illustrated.**

Treatment: **To be discussed in the next installments.**

IN ANY CASE OF joint abnormalities, correction and prevention depend on the knowledge of relative underlying factors. If these factors were revealed and explained according to each specific case, any modern dental operator should be able to provide and execute adequate technical and mechanical procedures to effect a satisfactory correction. The chief purpose here, then, is to clarify some of the factors of rehabilitation which are frequently confused and which must be considered basic principles in instituting the technical and mechanical procedure.

It is necessary to understand what conditions are normal to the patient for his age. The line of demarcation of what is normal and what is abnormal is not fixed and cannot be considered by any definite index. Graphically, one must allocate the normal within a reasonable area and the abnormal without that area. In so far as treatment of temporomandibular joint abnormalities is symptomatic, any proper treatment instituted to relieve the symptoms is restored within the area of normalcy. To illustrate this statement, two operators could not by any manner of calculation open the vertical dimension of a case to exactly the same measurement but nevertheless, if the measurement varied, let us say, a millimeter, the opening would be considered normal. But if one operator decided to open the vertical dimension only 2 mm. and the other as much as 10 mm., each might be wrong and outside the normal reasonable limits.

Anatomic Conformation

Anatomic conformation is the proper and normal relative state of those special structures and forces of the mouth, head, and face whose relationship to one another and proper coordination produce normal function. These structures and forces are divided by the median line into two separate units or mechanisms: a right and a left, each a highly specialized and well coordinated unit by itself. Each unit may function independently of the other under certain extraneous circumstances but normally the two units coordinate to perform as one well-balanced mechanism. Interrupted function on one side of the median line affects the opposite side by an enforced unbalanced compensation effort, thereby altering the coordinated function of the forces and structures of both sides as a unit. This is well demonstrated in cases in which trismus or semi-ankylosis of one side inhibits symmetry of function.

These structures and forces naturally and normally undergo a slight degree of uniform continual change over a period of time, which is compensated for by Nature in numerous ways, but they remain normal in their harmony and coordination relative to one another. This being true, the temporomandibular joints will remain normal in their anatomy and function.

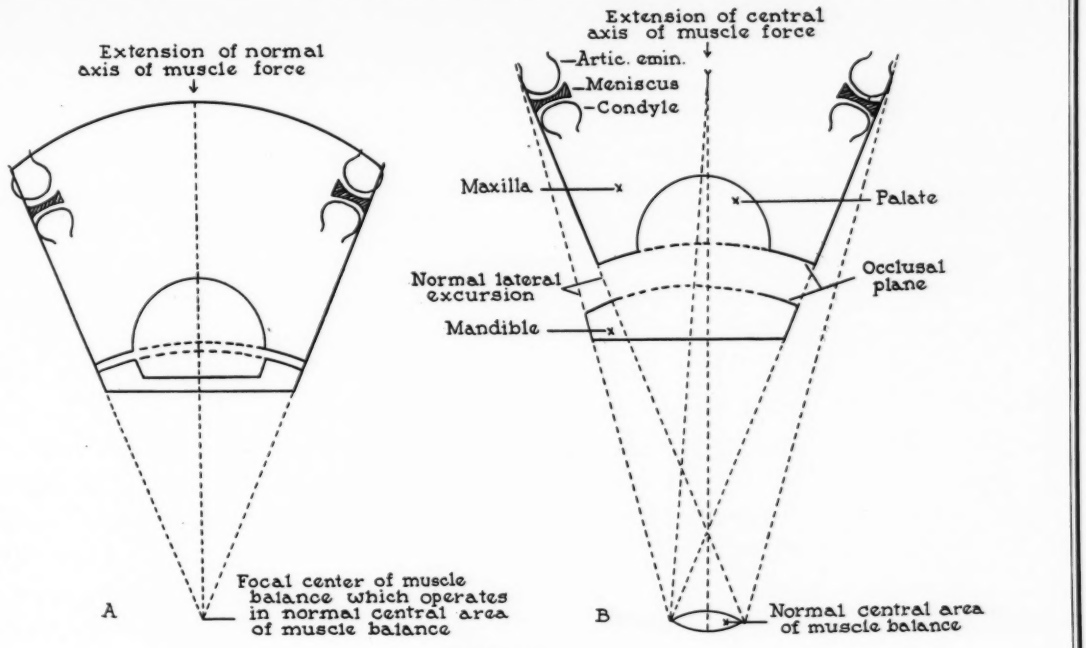


DIAGRAM I

The proper restoration and reconstruction of the teeth relative to the normal well-being of these structures and the control and regulation of these forces depend on the actual consideration of their relative harmony with one another.

Abnormal Articulation

Abnormal articulation of the temporomandibular joint results from loss of harmony of the essential factors that govern normal balanced function of the right and left mechanisms. By the alteration of any one of these factors, a sudden attempted adaptation of the other is necessitated to an abnormal degree in order to compensate for it. The proper correction depends on the correct reestablishment of normal balance by dental restoration.

Normal Anatomic Structure of the Temporomandibular Joint

The normal temporomandibular joint is designed to permit, by virtue of its compact close-fitting structures, a wide range of movement of the mandible with a minimum amount in the joint itself, and in the performance of its normal function, it will withstand unusual stresses without serious injury. Usually an impairment of its function or alteration of its structure is due to alteration of the muscular forces and the teeth, resulting from traumatic injury, blows, accidents, surgical trauma following the removal of impacted third molars, and missing posterior teeth, which are causes removed from the joint itself.

Mandibular Fossa—The mandibular fossa is located in the tympanic portion of the temporal bone and is inclined inward toward the front. It is bounded frontally by the articular eminence of the zygomatic process which has a hard, thin layer of bone on its articulating surface covered by cartilage. The lateral wall is a thin plate of bone presenting the petrotympanic fissure.

Condyle Head—The head of the condyle rests on the posterior slope of the articular eminence in the mandibular fossa and its articular surfaces extend into the fossa, not quite so far as the petrotympanic fissure, where it is covered with connective tissue, and only on its anterior slope is it covered with cartilage. It is important that the head of the condyle does not impact the petrotympanic fissure which is so often the case in abnormal joint conditions (See Color Plate).

Meniscus and Joint Cavities—Between the condyle on one side and the fossa and articular eminence on the other lies the biconcave connective tissue disc or meniscus. Two joint cavities are formed by the attachment of the capsular ligament to the meniscus.

Capsular Ligament — Superiorly, the capsular ligament extends from the upper border of the meniscus to the circumference of the articulating surface of the fossa and articular eminence; inferiorly, the ligament extends from the lower border of the meniscus to the neck of the condyle, extending lower in back than in front. The ligament, being shorter in the front and outer surfaces, restricts abnormal backward and inward motion of the condyle; whereas, being longer in back, it permits more movement normally anteriorly, downward and forward.

Temporomandibular Ligament — The temporomandibular ligament, arising from the zygomatic process, passes downward and backward to the lateral and posterior surfaces of the neck of the condyle. It functions as a strengthening ligament for the capsular ligament, and by its inclination also restricts abnormal backward and inward motion. From the region of the petrotympanic fissure, a weak fibrous band is attached to the neck of the condyle.

Sphenomandibular Ligament—The sphenomandibular ligament arises on the medial side of the joint, from the angular spine of the sphenoid bone and the petrotympanic fissure of the temporal bone, just distal to the articulating surface of the fossa, and passes downward and forward to the inner surface of the ramus of the mandible, broadening there over the mylohyoid sulcus. The sphenomandibular ligament is separated from the temporomandibular ligament and the condyle by a space through which pass blood vessels and the auriculotemporal nerve. This nerve is important in this presentation because it is one source of pain in abnormal joint conditions, inasmuch as it passes intimate to the joint in the joint capsule. This ligament is of cartilage and normally assists in preventing overaction and displacement forward, laterally and downward.

Stylomandibular Ligament — The stylomandibular ligament is only a band of fascia which does not materially assist the joint in any respect.

Normal Anatomic Structure of the Temporomandibular Joint

The anatomic movement of the normal joint displays articulation of the upper anterior third of the condyle with the lower posterior plane of the articular eminence, not deeply in the fossa of the temporal surface of the joint, nor back against the tympanic plate. The condyle moves forward and downward to and slightly past the crest of the *eminentia articularis*.

Normal mandibular movement is a well coordinated movement confined to normal functional limits by normal joint structures; that is, proper tension of the capsular ligaments, sphenomandibular ligaments, temporomandibular ligaments and muscles. It is the coordination of three distinct movements. These movements are: (1) the opening movement or arc; (2) lateral, and (3) anteroposterior (forward and backward). It is in this respect that all modern mechanical articulators fail in accurate correction and reconstruction, because they only provide for two dimensional movements, namely: anteroposterior and lateral, not the opening arc of movement; hence, it is best, particularly in correction cases in which the opening arc or vertical dimension is the prime

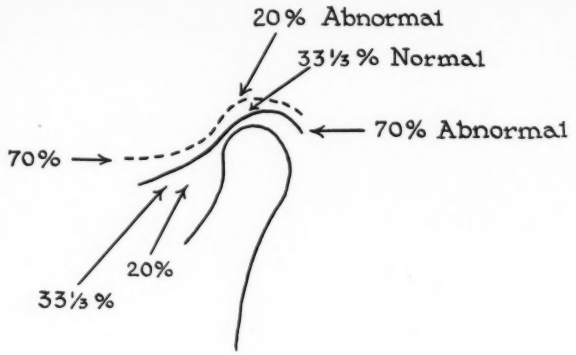


DIAGRAM II

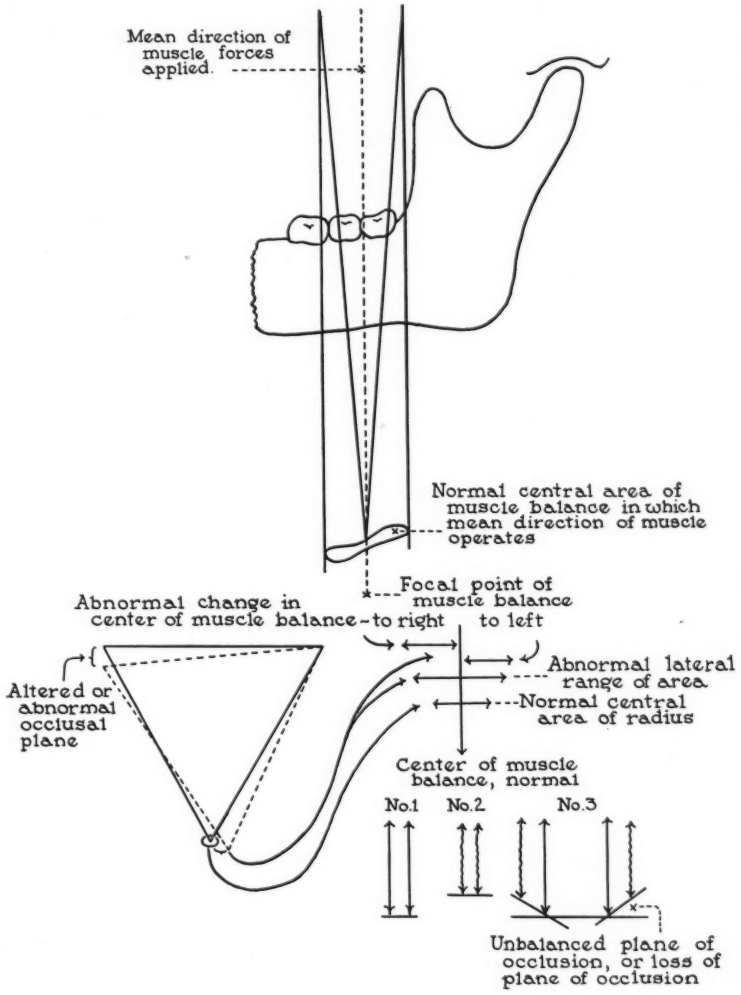

Mean direction of muscle forces applied.
Normal central area of muscle balance in which mean direction of muscle operates
Focal point of muscle balance
Abnormal change in center of muscle balance
to right
to left
Abnormal lateral range of area
Normal central area of radius
Altered or abnormal occlusal plane
Center of muscle balance, normal
No.1
No.2
No.3
Unbalanced plane of occlusion, or loss of plane of occlusion

DIAGRAM III

1) Normal tension of muscle fibers in normal jaw relationship.
2) Slackened tonus of muscle fibers in abnormal overclosure of jaw.
3) Slackened tonus of muscle fibers on left side during overclosure of left joint. Slackened tonus of muscle fibers on right side during overclosure of right joint.

Anatomy of Temporomandibular Joint

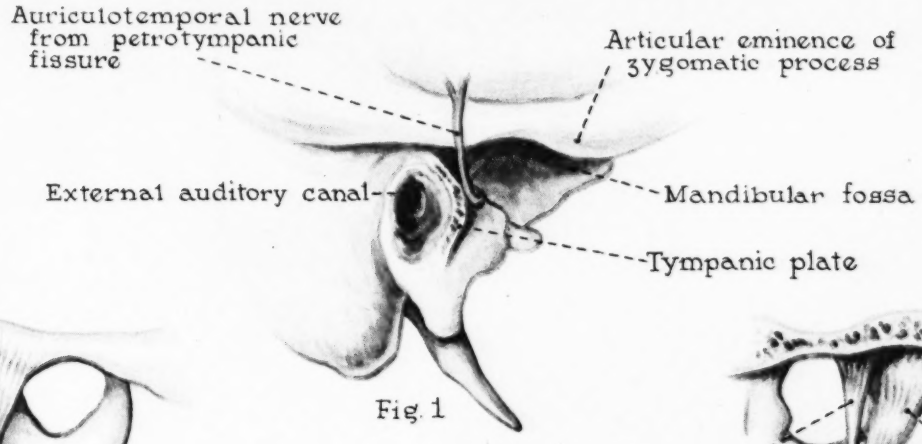


Fig. 1

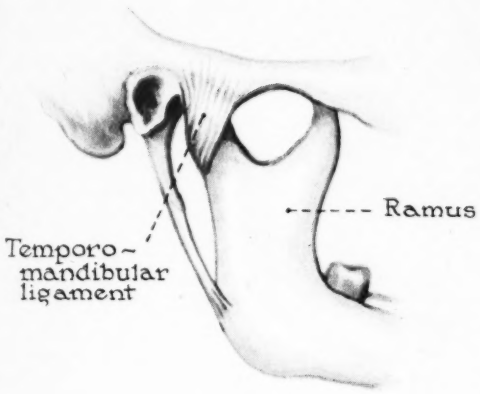


Fig. 2

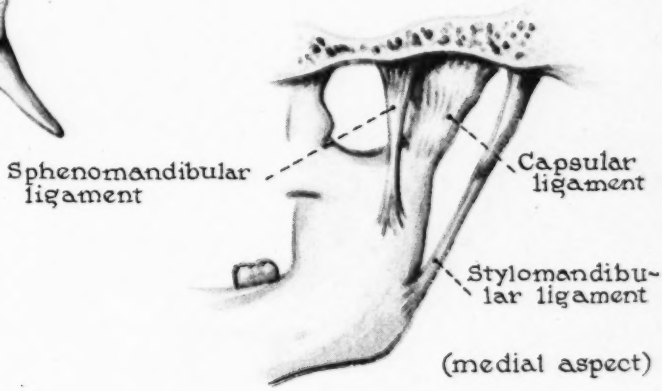


Fig. 3

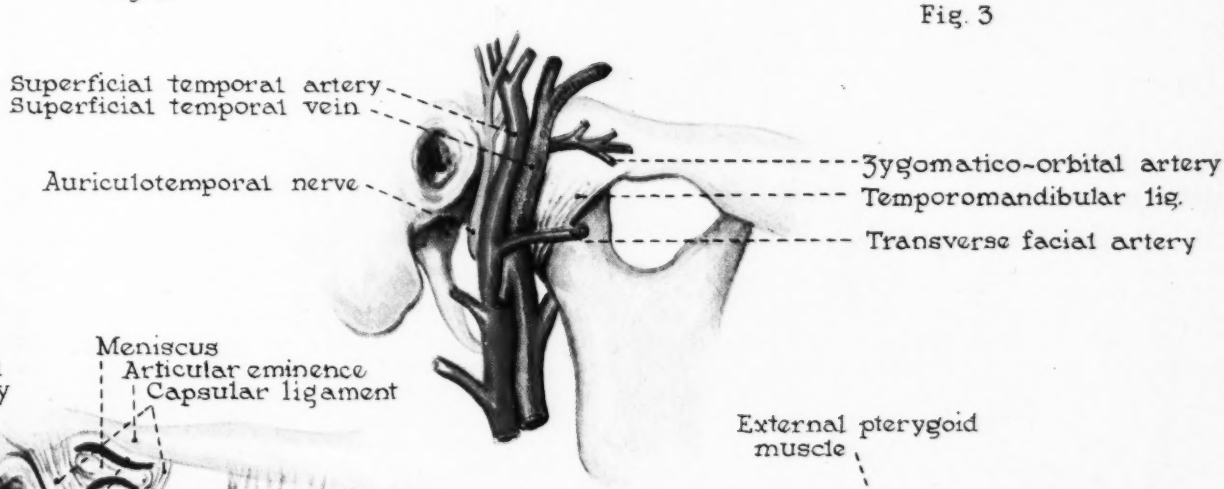


Fig. 4

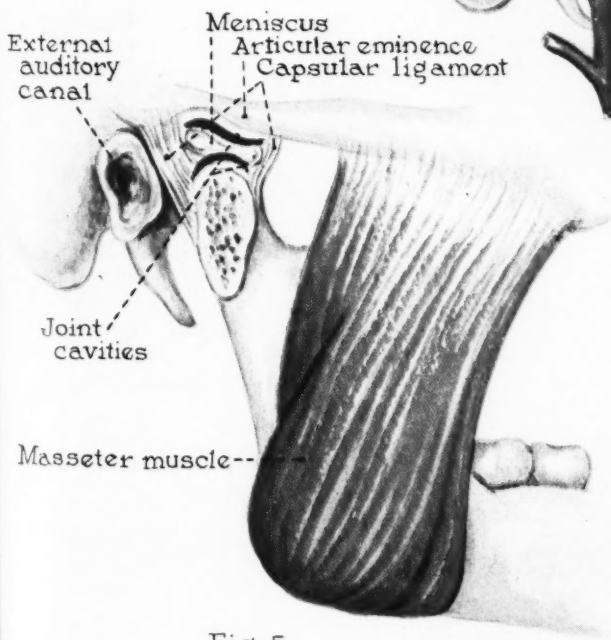


Fig. 5

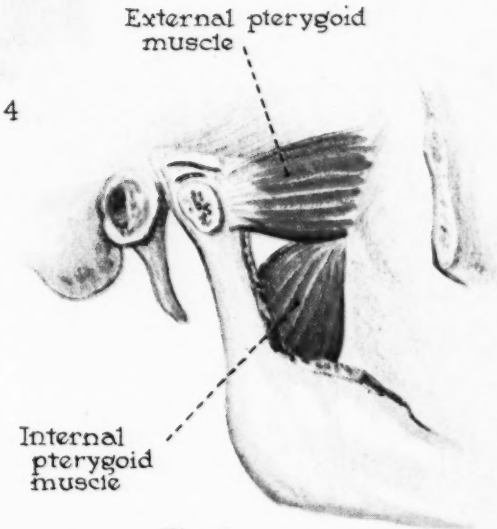
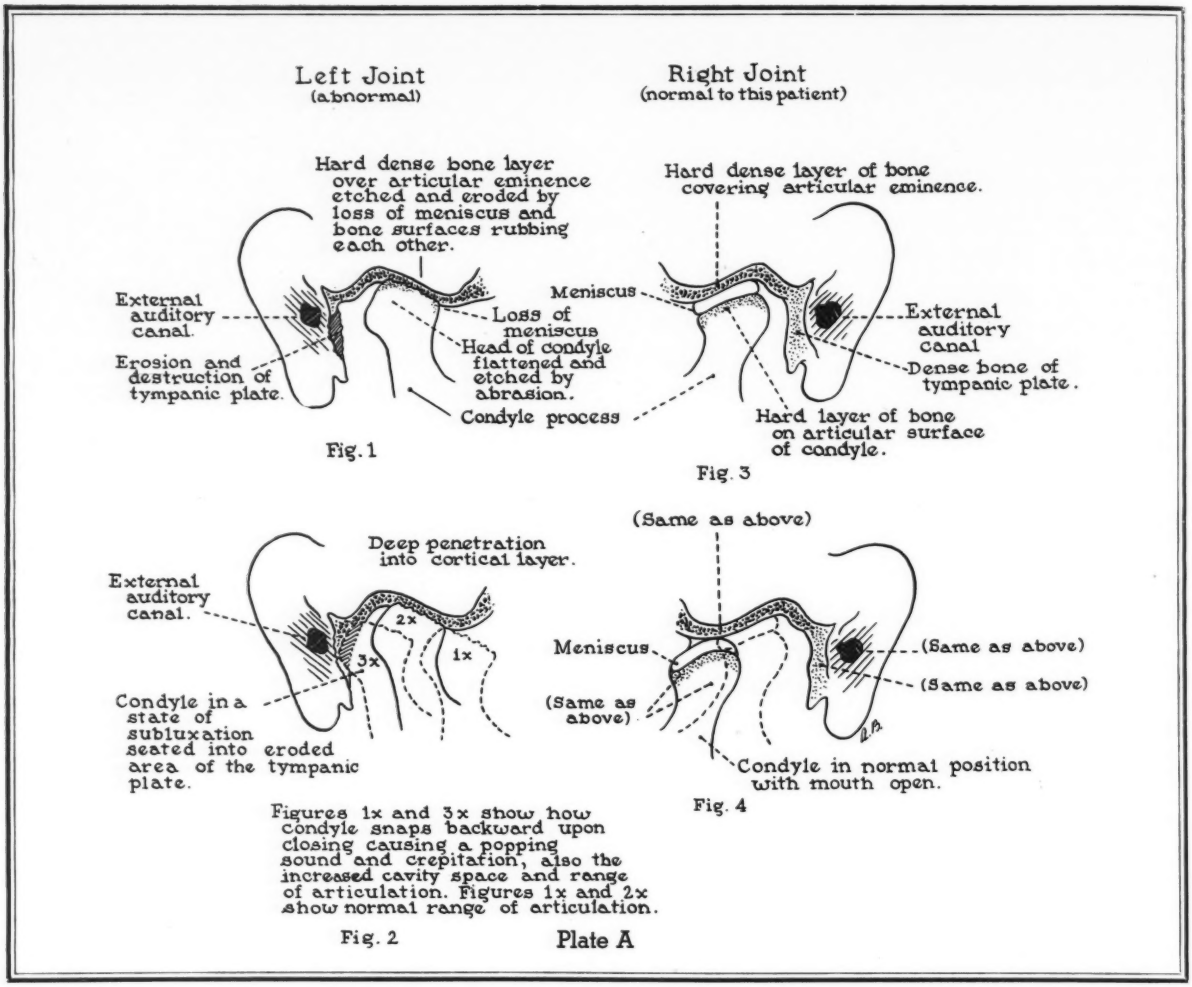


Fig. 6

A. Bartenbach


Left Joint
(abnormal)
Right Joint
(normal to this patient)
Hard dense bone layer over articular eminence etched and eroded by loss of meniscus and bone surfaces rubbing each other.
External auditory canal.
Erosion and destruction of tympanic plate.
Loss of meniscus
Head of condyle flattened and etched by abrasion.
Condyle process
Fig. 1
Hard dense layer of bone covering articular eminence.
Meniscus
External auditory canal
Dense bone of tympanic plate.
Hard layer of bone on articular surface of condyle.
Fig. 3
Deep penetration into cortical layer.
External auditory canal.
2x
3x
1x
Condyle in a state of subluxation seated into eroded area of the tympanic plate.
(Same as above)
Meniscus
(Same as above)
(Same as above)
(Same as above)
Condyle in normal position with mouth open.
Fig. 4
Figures 1x and 3x show how condyle snaps backward upon closing causing a popping sound and crepitation, also the increased cavity space and range of articulation. Figures 1x and 2x show normal range of articulation.
Fig. 2
Plate A

factor to be considered, that after establishment of the degree of opening on either side or both as the case may require, all operative reconstruction be done directly in the mouth or as much so as possible and all prosthesis be corrected in the mouth before it is finished.

1. *Arc Movement*—The opening and closing arc is described by the mandible moving downward and forward and rotating on the opening axis which is five-eighths inch below the condyle cord at right angles to the 33 1/3 degree downward and forward path. These are average and are variable proportionately to each other in individual cases.

2. *Lateral Movement* — The lateral movement or side-to-side excursion of the mandible (Diagram I) is caused by its rotation on a central axis, not on a right and left axis—one condyle does not remain pivoted and immobilized while the other moves to accommodate lateral excursion; thus the arc scribed in normal cases will be 180 degrees if continued, and not the intersection of two arcs as would be the result of a right and left axis. This central axis is located within the hypothetical normal central area of muscular balance. During lateral excursion the balancing condyle moves inward and downward, thereby registering the Bennett movement, an angle of 16 degrees between the protrusive and lateral ranges on the accepted 33 1/3 degree downward and forward path against the articular eminence. This is governed and variable only by the degree of inclination of the temporomandibular fossae in the skull as they converge toward the front.

Normal lateral range is measured to be about one-fourth or one-eighth inch each side of the median line (Diagram I, B).

The lateral movement is important in correcting temporomandibular cases because it is abnormal lateral sway or reaching that is responsible for many painful symptoms. This will be discussed in more detail later.

3. *Anteroposterior Movement* — Normal anteroposterior movement follows the normal condyle path and is maintained by the teeth which follow in the same path. The foremost tip of the corpus of the mandible follows in the same path or curve by the articulation of the lower anterior teeth against the lingual surfaces of the upper anteriors and the inclined planes of the lower posterior teeth against those of the upper posterior. This path is an ogeed curve.

All three normal movements of the mandible in perfect coordination, governed by normal muscular balance, tend to maintain the temporomandibular joints in normal articulation without severe wear and tear on them despite a continual gradual

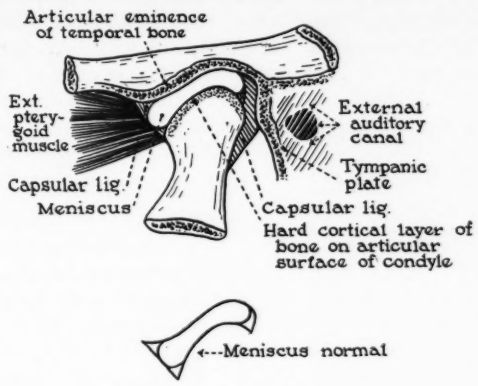


Fig. 1

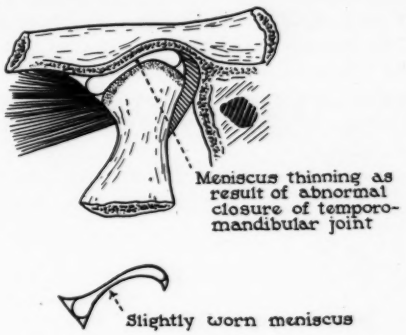


Fig. 2

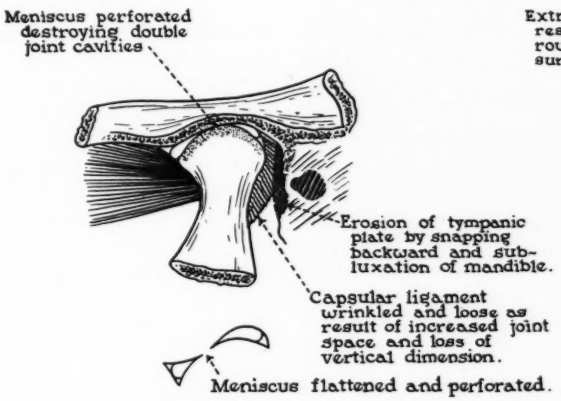

Meniscus perforated destroying double joint cavities
Erosion of tympanic plate by snapping backward and sub-luxation of mandible.
Capsular ligament wrinkled and loose as result of increased joint space and loss of vertical dimension.
Meniscus flattened and perforated.

Fig. 3

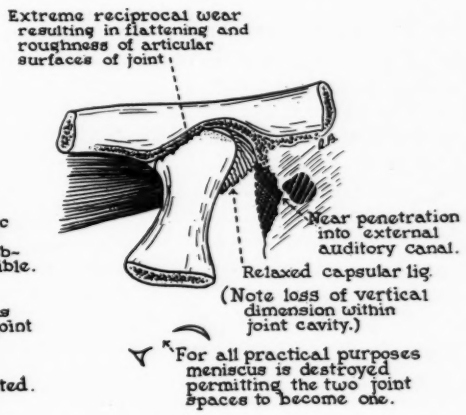

Extreme reciprocal wear resulting in flattening and roughness of articular surfaces of joint
Near penetration into external auditory canal.
Relaxed capsular lig.
(Note loss of vertical dimension within joint cavity.)
For all practical purposes meniscus is destroyed permitting the two joint spaces to become one.

Fig. 4

Plate B

change through the years; however, if any one of the movements is definitely altered, it alters the others, and in turn, synchronous movement is inhibited, thereby altering normal joint movement and impairing joint structures.

Abnormal Articulation of the Deformed Joint (Plates A, B, C)

Abnormal articulation of the deformed joint may reveal:

1. Abrasion, flattening the articulating anterosuperior surface of the condyle.

2. Deep erosion of the fossa on any or all articulating surfaces, thereby increasing the cavity space and encroaching on the highly innervated and sensitive dura.

3. Thickening of joint tissues and tissue formation as a result of injury.

4. Steepened or flattened plane of the posterior surface of the articular eminence.

5. Thinning and perforation of the meniscus with a tendency to roughness. Destruction of the meniscus destroys the two joint cavities, making them one cavity, thereby allowing bone surfaces to wear against each other and producing crepitation which is only infrequently observed.

6. Unusual mobility of the condyle in all directions of its articulation re-

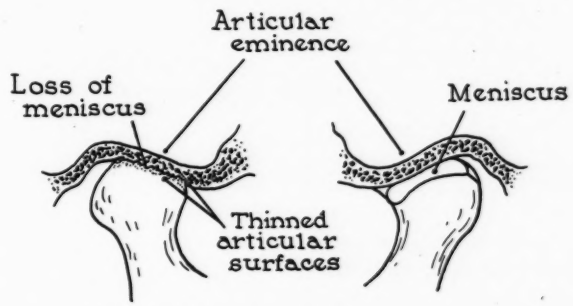


Fig. 5—Note loss of vertical dimension in left joint as a result of loss of meniscus and loss of bone structure on both articulating surfaces.

Plate C

sulting from the relaxation and stretching of the capsular, temporomandibular and sphenomandibular ligaments. The lateral mobility is also increased by the muscles of lateral excursion gaining in power over the vertical by virtue of the shortened vertical dimension.

The mandible, being a suspended member, is propelled in its joint action and path movement by the muscular forces produced principally by the muscles of mastication, namely the temporal, masseter, internal and external pterygoids.

This brings us to the principal underlying factors to be reckoned with in correcting abnormal joint conditions and maintaining normal joint action and mandibular movement. These factors will be discussed in the next issue.

(*End of First Installment*)

3720 *Washington Boulevard.*

Effect and Control of Directional Force in the Arrangement of Artificial Teeth

(*Continued from page* 59)

maxillary denture for a long time.

In developing the natural dentition Nature erupts the lower incisors first and on account of their smaller size, the teeth of the mandible are each one-half a tooth in advance of its upper fellow, in that each tooth of the dental series has two antagonists with the exception of the lower central incisors and upper third molars. The technique of arranging artificial teeth should simulate the natural development by starting with the mandibular anterior teeth and setting the incisors, bicuspids and molars to their correct height and anatomic ridge relations. This procedure reduces the mystery of an upper and lower to the better understood technique of making a maxillary denture to natural mandibular teeth; the plane of occlusion is more favorable than natural teeth alignments and the esthetics of the upper teeth more accurately controlled.

To correct and control the variable of the upper perpendicular length (the mystery of the bite), the height of the lower bite-block is carved to the level of the lower lip when the lips are at rest. All other steps of the bite-taking procedures are the same as the conventional systems except that the vertical dimension is always considered incorrect, and is opened or closed for mechanical or esthetic requirements without changing the arrangement of the lower teeth.

When arranging artificial maxillary teeth (complete upper) to natural mandibular teeth, the bicuspids or molars—not the anterior teeth—are the first to be arranged to favorable occlusion and in accordance with directional force. Vertical errors in the bite are corrected in the mouth; the case is reattached to the bow of the articulator, and, beginning with the molar, the teeth are rearranged to the mechanical and esthetic requirements (Figs. 13 and 14).

The step-by-step technique is demonstrated in the illustrations.

450 *Sutter Street.*

DENTAL MEETING *Dates*

The St. Louis University Dental Alumni Association, annual reunion, Dental School Building, March 5-6.

•

Southern Dental Association, annual meeting, Charlotte, March 17-18.

•

Kentucky State Dental Association, eighty-first annual meeting, Brown Hotel, Louisville, April 7-9.

•

Alabama Dental Association, seventy-second annual meeting. Tutwiler Hotel, Birmingham, April 8-10.

•

The Old Dominion Dental Society, twenty-eighth annual meeting, Staunton, Virginia, April 14-15.

•

Sigma Epsilon Delta Fraternity Convention, fortieth anniversary Hotel Pennsylvania, New York City, April 5-6.

•

The American Society for the Advancement of General Anesthesia in Dentistry, regular meeting, Midston House, New York City, March 24.

•

Dallas Mid-Winter Dental Clinic, Hotel Adolphus, Dallas, Texas, April 21-23.

•

Louisiana State Dental Society, sixty-first annual meeting, Hotel Roosevelt, New Orleans, May 1-3.

•

Cleveland Dental Society, annual Spring meeting, Statler Hotel, Cleveland, May 5-7.

•

New Jersey State Dental Association, annual meeting, Berkeley, Carteret Hotel, Asbury Park, May 7-9.

Elastic Traction in Fracture Fixation

ALLISON H. MILLER, D.D.S., Kingston, Pennsylvania

DIGEST

In the treatment of fractures the author believes that not enough attention has been given to the comfort and hygiene of the patient and that too much attention has been given to firm and immediate fixation. With the shift in emphasis in mind, a clean and gentle method of fixation by external elastic traction through the use of the rubber dam is suggested; the armamentarium is outlined; and the way to use this method is illustrated. Modifications of the technique for complicated cases are likewise suggested.

IN THE TREATMENT OF maxillary and mandibular fractures, too much attention has been given to firm and immediate fixation and too little attention has been paid to the comfort and hygiene of the patient. Too much time and effort have been spent by the conscientious dentist in wiring the remaining teeth of the patient firmly together, producing a tangle of wire, loops and teeth, impossible to keep clean and uncomfortable to retain. Heads have been clipped or shorn of all hair, and solid, tight and poorly ventilated plaster skull caps placed thereon.

Elastic Traction Method

For the last ten years, following an original suggestion given by Doctor B. B. Machat of Brooklyn, we have been using in private practice as well as in the hospital, the comparatively clean and gentle method of fixation by the use of the rubber dam, which is illustrated in this article.

In most mandibular fractures, it is possible to obtain the same results by application of this constant, gentle, extra-oral pressure of the rubber dam formerly obtained by rigid wire fixation. Even if a considerable amount of edema is present, it is possible to obtain more rapid and more comfort-

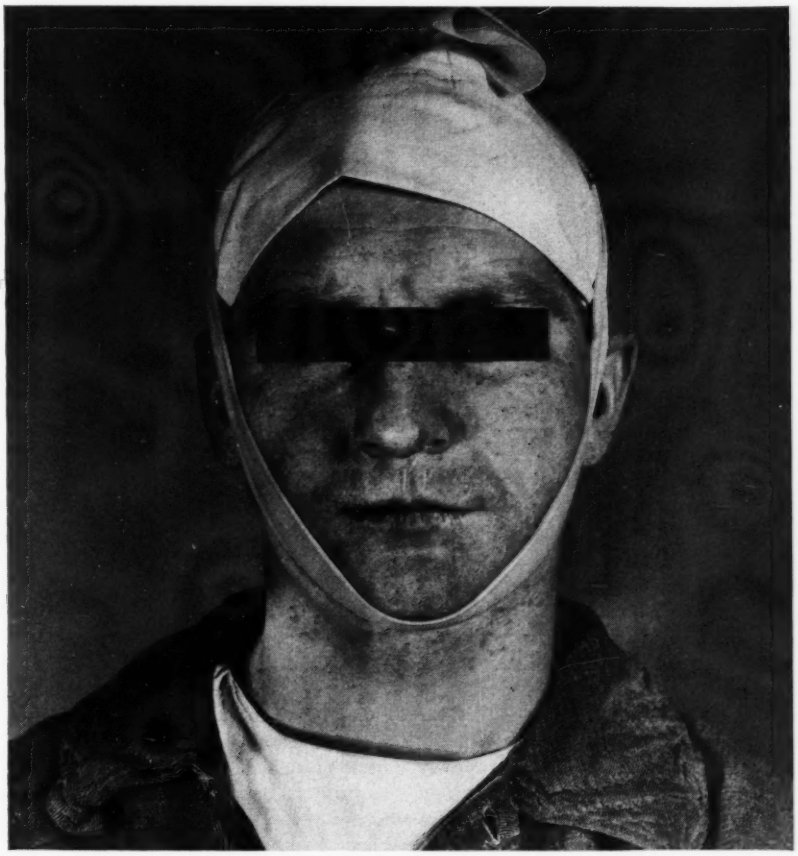


Fig. 1 (top)—Snugly-fitting unbleached muslin skull cap, used as anchorage for ordinary rubber dam which is doubled and tied with knot on top and fastened on side with safety pins.

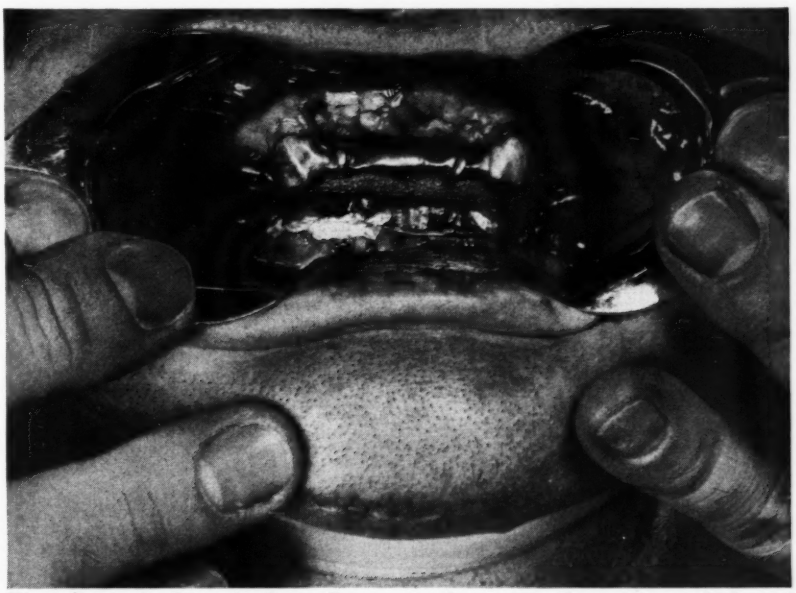


Fig. 2 (bottom)—Cast coin silver splints cemented upon several remaining teeth. Loss of bone and teeth extensive. (Same patient as in Fig. 1.)

Fig. 3—Same patient shown in Figs. 1 and 2. Note traumatic separation of maxilla in compound fracture. The spread tuberosities were held in place by tension applied through bending of cast splint in anterior portion, thus producing inward pressure at molar areas.

able reduction of fractured parts. The separated areas are held in comparative adaptation and slowly pressed back into place with little pain by outwardly applied pressure during what might be termed the "acute" condition of the fracture. It is not necessary to wait until the edema subsides before instituting treatment. Opposing teeth, with their cusps and inclined planes, act as guides to their attached portions of bone. Comfortable centric occlusion is thus slowly obtained and frequently maintained steadily throughout the duration of treatment without the use of any other device.

The upward pressure of the stabilized rubber dam should be adjusted to suit the comfort of the patient. At the same time, this pressure should be sufficient to hold the teeth in their normal occlusion, permitting the maintenance of centric occlusion to hold the bone fragments in apposition. The rubber dam produces this desired pressure constantly and with little pain, and affords the added advantage of being easy for the patient to remove in an emergency.

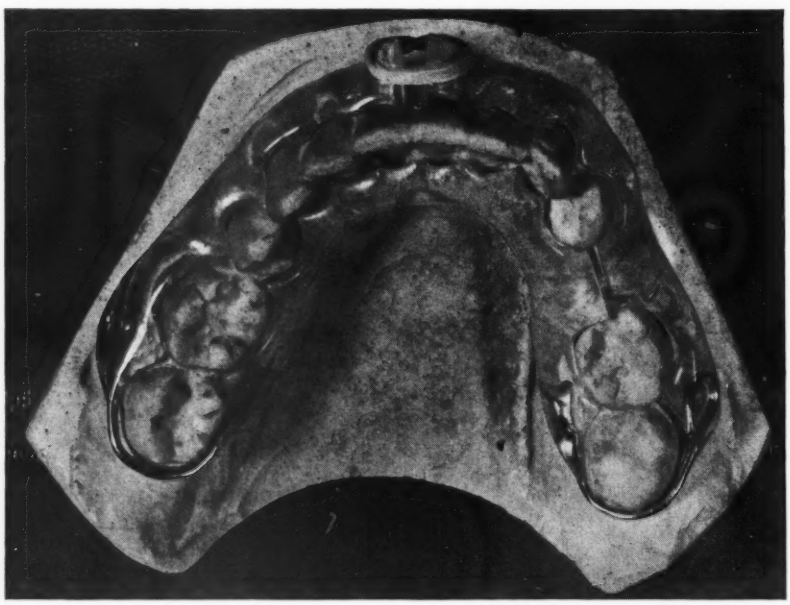


Fig. 4—Clear acrylic resin splint, removable, nevertheless firm enough for treatment of mandibular fractures. Note open occlusal surfaces. Such a splint is also useful as a stabilizer for loosened teeth during progress of osteomyelitis.

Modifications

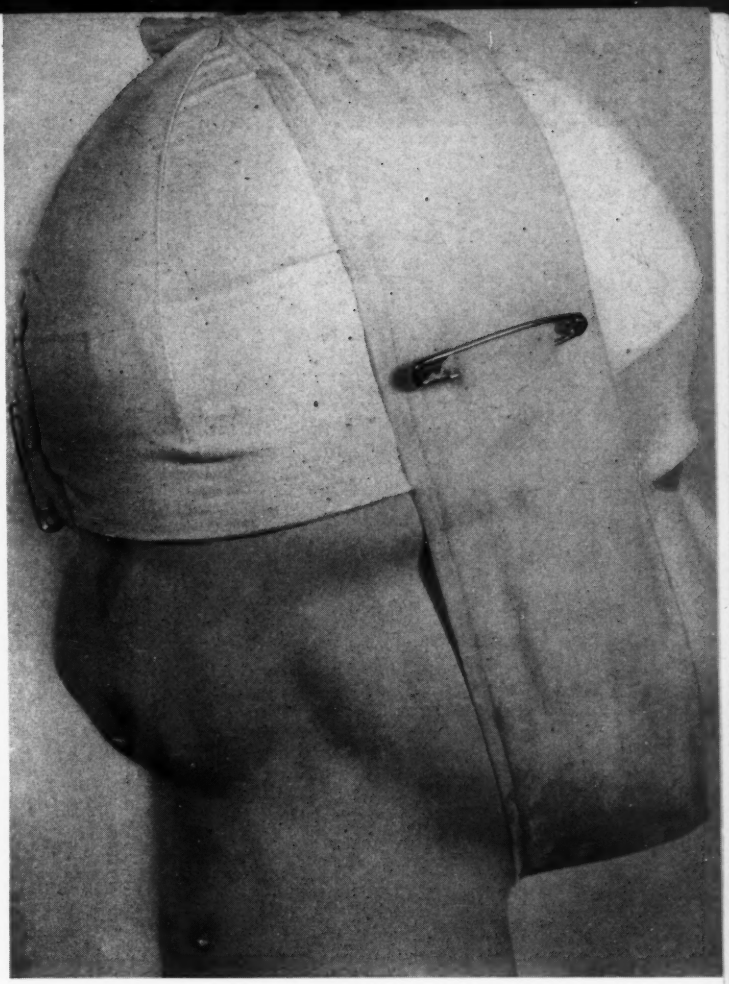
To be sure, modifications of any technique are necessary for proper treatment of some complicated cases. Occasionally it is necessary to use a combination of solid splints, removable splints, intra-oral and extra-oral traction. Rarely, however, must we use and incorporate in a modified skull cap, clothes hanger wire extensions as fulcrums for rubber band pull of widely separated parts. Doctors Ivy and Curtis[1] well illustrate and completely explain the treatment of many complicated cases requiring more elaborate apparatus.

Frequently simple fractures of the mandible, through symphysis and bicuspid regions, are complicated by fracture of the condylar head. Open reduction of these condylar head fractures is no longer advised. Such fractures yield particularly well to the gentler method of treatment suggested here. The natural remaining teeth act as guides and stabilizers. Rest, and adaptation of the fractured parts are given by the constant, upward pressure of the externally applied rubber dam. If many teeth are missing, splints may be cast of coin silver over casts made from modeling compound impressions of the mouth. These impressions are made, however, after elastic traction has been in use for several days during the so-called acute condition. One such complicated case is illustrated in Figs. 1, 2 and 3. In this case the molar in line of one of the fractures in the mandible was allowed to remain in situ with the hope of retaining the ascending ramus fragment in correct position until at least some callous formation occurred. This tooth not only performed that duty, but still remains in the mouth and retains its vitality.

Within the last year there was displayed at one of the New York dental meetings a clear acrylic resin splint. It was constructed in the Dental Corps of the United States Army. Such a splint has many possible uses in treatment of fractures and osteomyelitis of the mandible. The natural cusps of all the teeth are exposed and the patient can readily remove and replace it for cleaning. It may be used most successfully in conjunction with the elastic head gear (Fig. 4).

The following equipment will be necessary for external elastic trac-

[1]Ivy, R. H. and Curtis, Lawrence: Fractures of the Jaws, Philadelphia, Lea & Febiger, 1931.



Figs. 5 (left) and 6—Two views showing application of five-inch rubber dam, doubled, to headcap of unbleached muslin. Ends of rubber dam are either knotted or pinned on top of head.

tion: (1) A snugly-fitting skull cap of unbleached muslin which can be made rigid and reenforced with gummed paper tape; an ordinary 6 inch rubber dam; large and small safety pins. During the hot summer months, a chin strap of unbleached muslin may be used instead of the hot rubber dam. The chin strap may be fastened to the skull cap with rubber bands running through hooks and eyes sewn to the ends of the strap and edges of the skull cap.

Comments

It is imperative to instruct the patient about all the procedures, stressing the necessity for his cooperation, the cleanliness of his mouth, and importance of his diet. Patients appreciate the fact that in the event of hysteria, nausea or great discomfort, the whole apparatus may be quickly removed.

299 *Wyoming Avenue.*

HERPES SIMPLEX OF THE LIPS (An Abstract)

[Walter M. Burnet, M.D.: Virginia Medical Monthly, and Digest of Treatment, 4:262 (October) 1940.]

Definition — Herpes simplex is otherwise known as fever blisters.

Cause—Unknown.

Theory of Causation—Herpes is thought to be of bacterial origin.

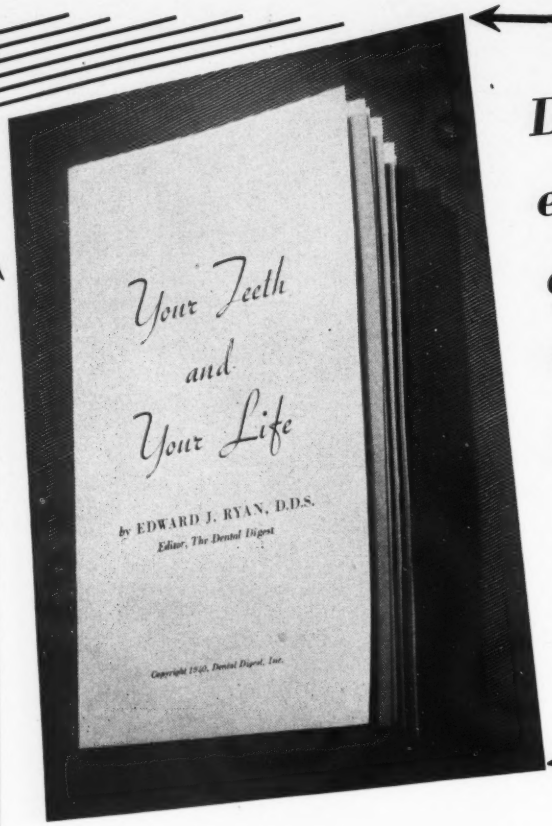
Occurrence — The lesions occur after gastro-intestinal disturbances, respiratory infections, colds, sunburn, toxic and febrile states and reflex irritation.

Appearance—The eruption is usually observed on the face, ears and genitals. The lesions are usually multiple, vesicular in type and on erythematous and edematous bases. The large solitary lesion often seen on the lip is sharply localized and the most disturbing and disfiguring.

Characteristics—The vesicle is usually well below the surface. It is tender and painful. The walls of the lesion are thick and have a tendency to rupture but rarely suppurate. The pain and irritation are due to pressure within the vesicle. The exudate from the vesicles is both auto-inoculable and hetero-inoculable.

Duration and Course—The lesion may persist for many days until the tension is relieved by rupture and the escape of the fluid. If the lesion is untreated the vesicles after many days usually dry and yellowish crusts are formed.

Treatment — Multiple punctures with a sterile, fine hypodermic needle, to release the tension, thus relieving itching and burning and hastening the formation of a scab. Healing will usually take place within a week.



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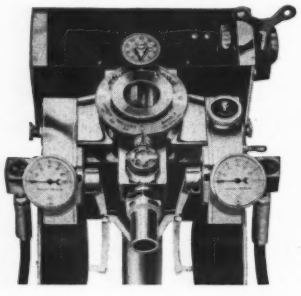

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NOTES ON THE

Cuff

Holy Grail—1941 . . .

In the crisp winter nights of my boyhood, I remember reading of the exploits of King Arthur's Knights and of Sir Launfal particularly who went in search of the Holy Grail. After his fruitless search, he returned home dispirited and despairing to discover that "The Grail in my castle here is found." Some modern Sirs Launfal, searching far-away and in remote places for a Grail that they call Democracy, fail to notice that the treasure they seek to rescue, to protect and defend, is on their native soil. They look to foreign countries to defend "the democratic way of life" while they indulge in rascalities and human neglect at home. They trust in sonorous abstractions to preserve the democratic spirit and all the while practice petty tyrannies in their own spheres of influence. It isn't enough to say that Democracy is a flaming sword to carry and advance human freedom; to say that Democracy is a shield to use in defence of human liberties—when at the same time in little ways or big, unanalyzed prejudices and preconceptions are scattered about. It isn't enough to join committees of "No" this and "For" that—self-styled protectors in the form of pressure groups whose motivations cannot always be discovered—these cannot defend Democracy. America has a representative government in whose hands official acts lie. The practice of Democracy does not come by "joining" but by behaving in "the democratic way."

Each man must come to think in simple terms of the meaning of the "democratic way of life"; how he contributes to it or undermines it in his every-day affairs. Democracy is not a tangible, bottomless grab-bag into which gluttonous self-seekers may dip at will to extract special privileges. It, Democracy, is an all-pervading spirit of good, kept vital and breathing, inspiring and productive by what

(*Continued on page* 87)

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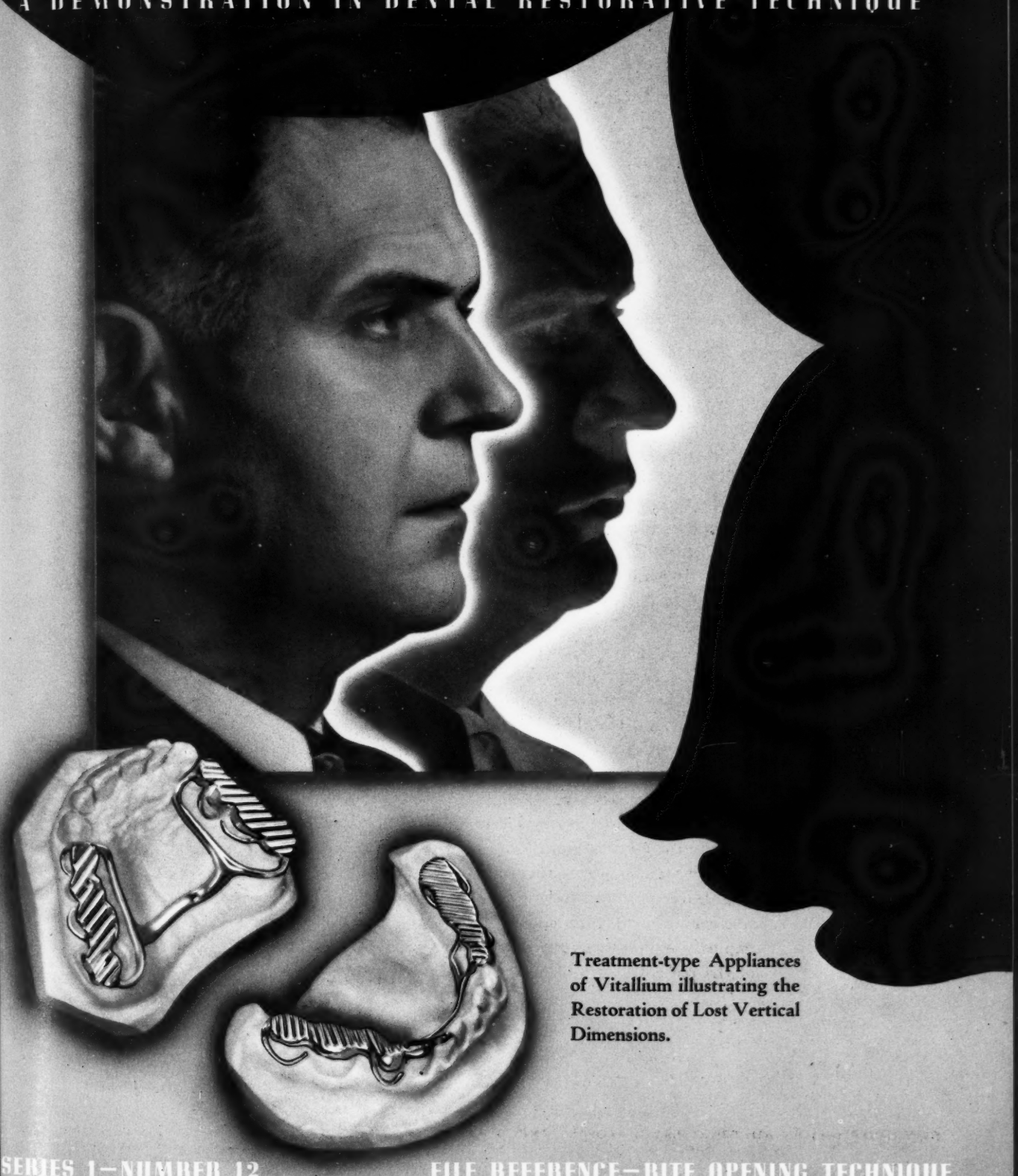

Treatment-type Appliances of Vitallium illustrating the Restoration of Lost Vertical Dimensions.

SERIES 1—NUMBER 12

FILE REFERENCE—BITE OPENING TECHNIQUE

This is the twelfth of a series of studies devoted to the structural units of prosthetic restorations. The patient was George Runyan, D.D.S., collaborating with C. F. Franzwa, D.D.S. Dr. Franzwa performed the operative work and designed the appliances, following the procedure in the recently published book "Step Technique for Opening the Bite."

The vertical dimension lost in this case was approximately 9 mm. Not only were the dimensions lost vertically, but there was a retrusion of approximately 8 mm. accompanied by malposition and a slight abrasion of the posterior teeth. The anterior teeth in the upper arch showed considerable destruction near the gingival line. While there was no evidence of abrasion on the incisal edges of the upper anteriors, the labial on the lower anteriors was considerably worn. The lower incisors functioned only in the singulum areas of the upper anteriors. Facial dimensions were shortened, causing an extensive roll of the lower lip. The protrusive effect of both the upper and lower lips resulting from the lost vertical dimensions caused a distortion of natural facial expressions. The hearing was not affected when the corrective appliances were placed in the mouth. The appliances were made of Vitallium because of its suitability for precision vertical dimension splints. Vitallium has the rigidity to withstand functional stresses and the strength and lightness that makes possible thin and graceful appliances without excessive bulk. The construction is of a treatment type. Natural cusp forms will be added after the treatment period. Prior to the restoration of lost dimensions, an extreme formation of ear wax was the only abnormal condition. Correcting the vertical and antero-posterior relations immediately eliminated the excessive ear wax. No recommendation of the particular construction is implied. All photographs have been used with the written consent of the patient.

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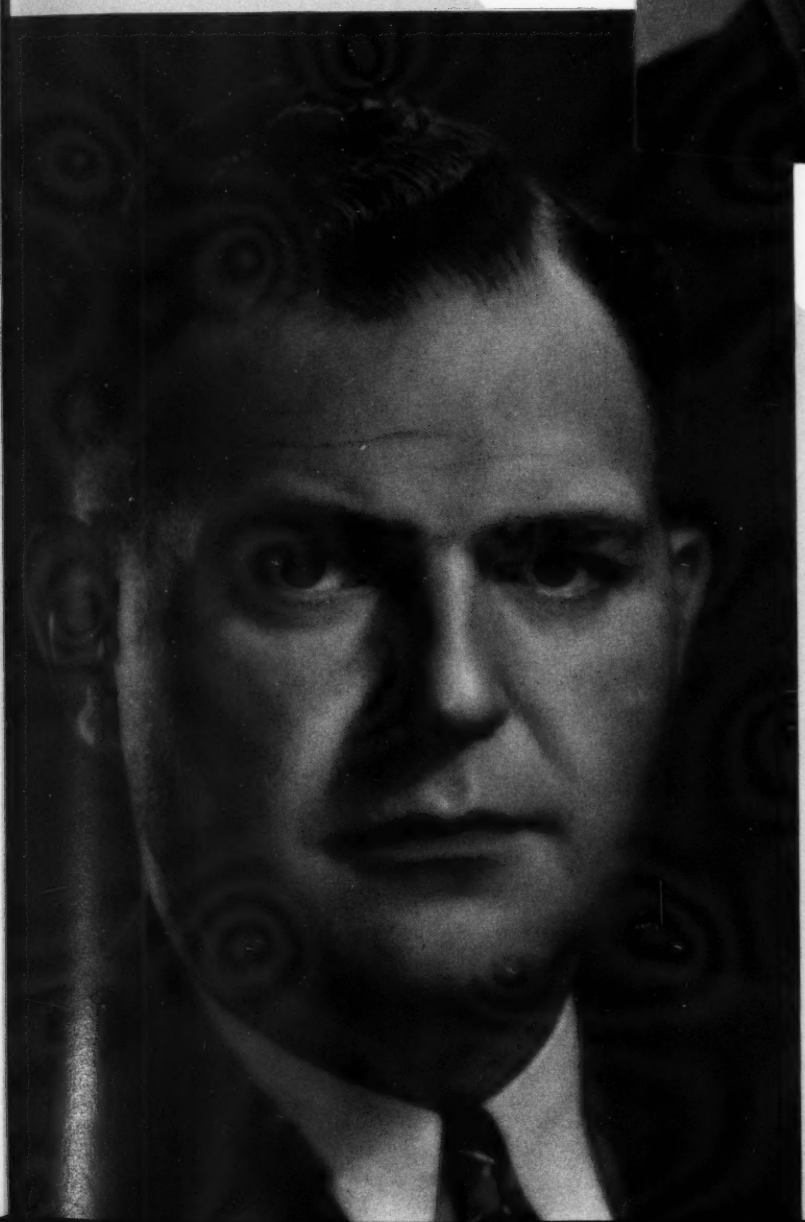
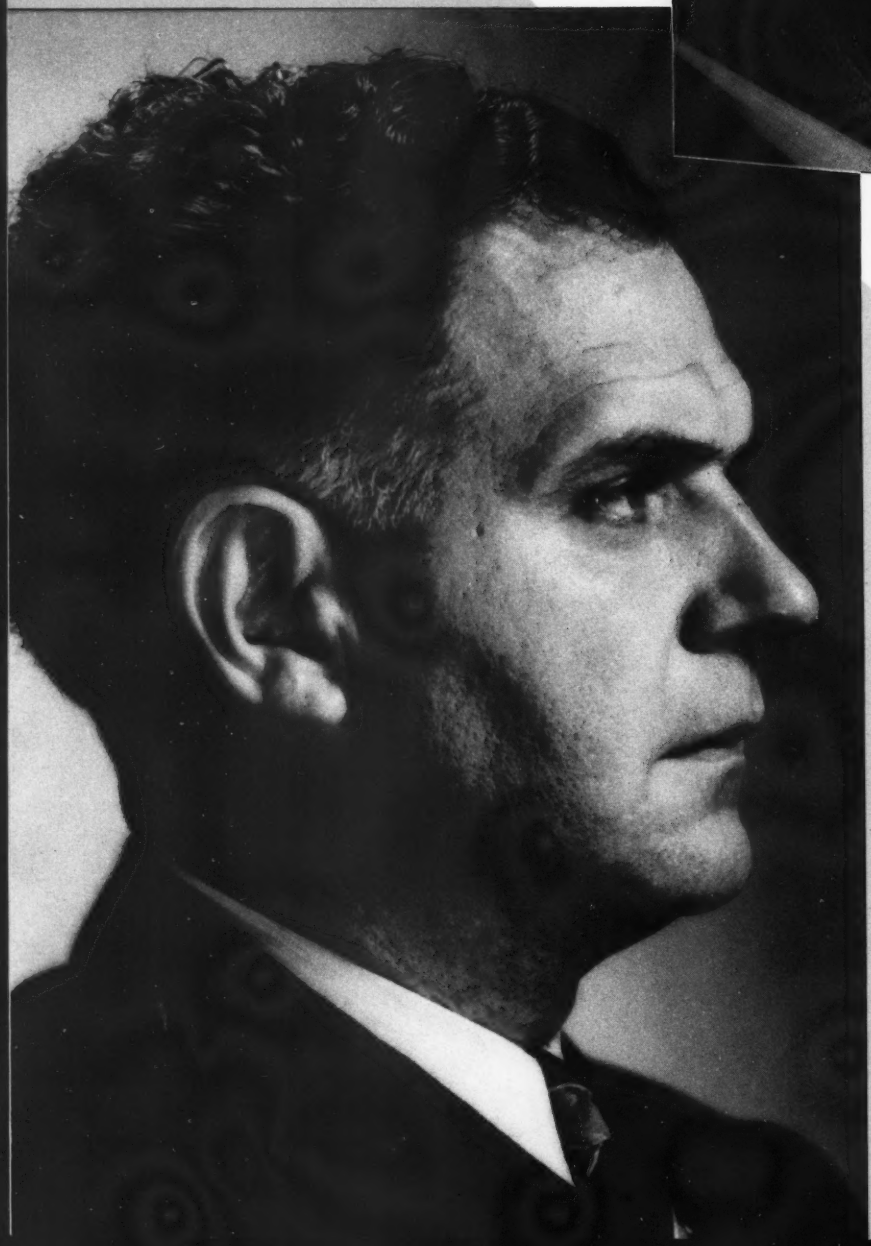
Compare these front views of the patient. The facial distortions in the small photograph are the result of a retrusion of approximately 8 mm. together with lost dimensions vertically of about 9 mm. Note the excessively deep crease below the lower lip and the prominence of the chin.



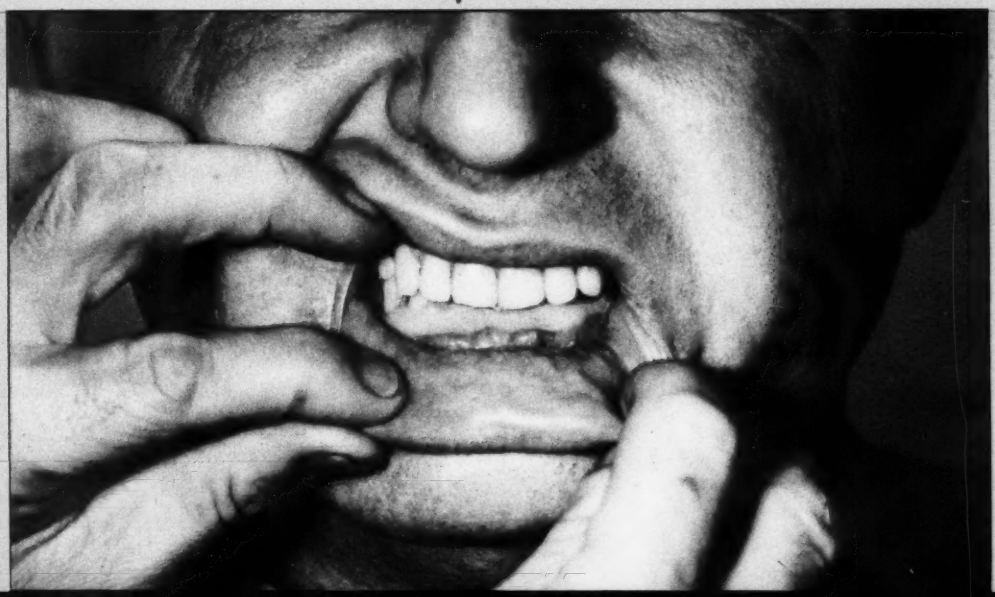
In the larger photograph the Vitallium bite-opening splints are being worn. Note the complete elimination of the depression in the chin and the increased vertical dimension from the tip of the chin to the base of the nose. General esthetics of the entire facial expression have been improved.

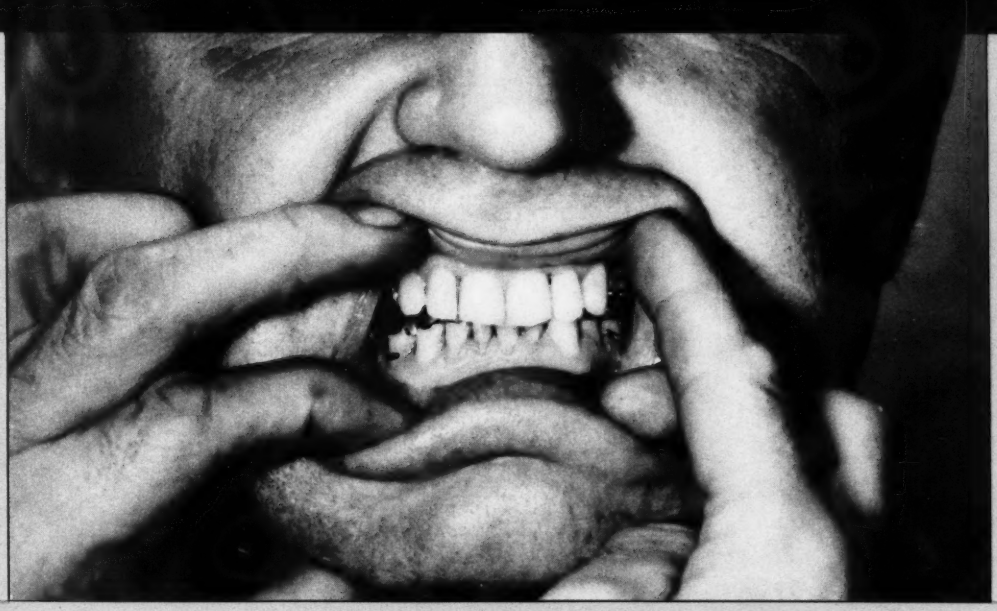
The profile affords another view of the extent of the distortion. The extreme prominence of the lips in a closed-mouth position is evident.



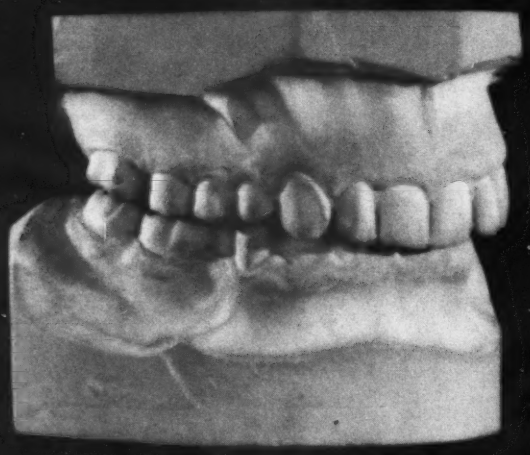
This lateral view shows the remarkable improvement made in facial form and expression with the Vitallium appliances in place, and illustrates not only a practical accomplishment of artistic and skillful dentistry, but also the benefits of such dentistry as a social and economic asset to individual patients.

The lips have been retracted to demonstrate the relationship of the lower teeth to the upper teeth. A heavy roll of tissue has developed around the gingival line of the lower teeth. The lower teeth are completely covered by the upper teeth. The lower anterior teeth have their incisal edges buried in the soft tissue at the gingival line on the palatal side of the upper anterior teeth.





The retracted lips show the relationship of the upper and lower anterior teeth to each other after insertion of the Vitallium bite-opening splints. The greater evidence of the improvement vertically, lies in the fact that the lower anterior teeth have been brought down and forward to a point where they provide high efficiency in function.

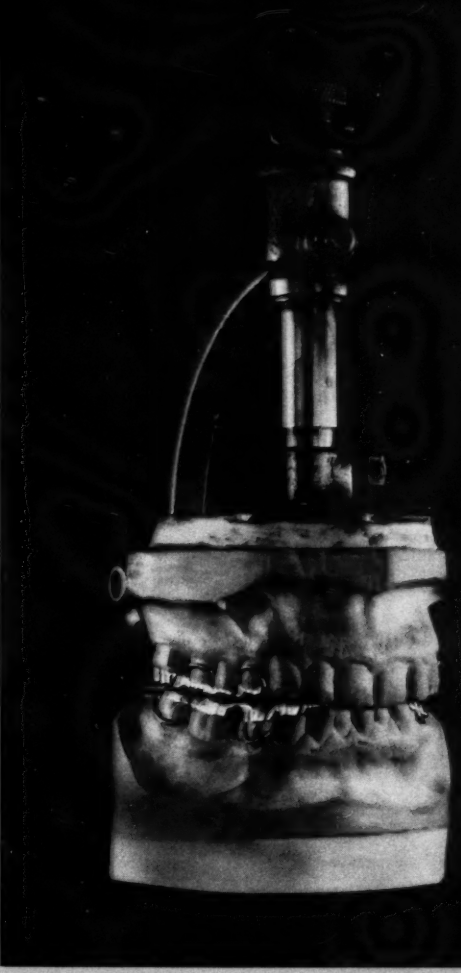


This photograph shows the relationship of the lower to the upper jaw in function before starting the prosthetic reconstruction. Note that the lower anterior teeth were completely covered by the overbite of the upper anterior teeth. There was no appreciable abrasion on the posteriors.

The corrected relationship of the lower arch to the upper. This relationship was found by the use of the Ballard Correlator.* The oral conditions and the Vitallium appliances are described and illustrated in this Prostheticlinic only as an additional contribution to the problems of bite raising procedures and as a result of successful accomplishment in this and other practical cases. It is fully recognized that there are other effective techniques which accomplish their purpose.

*The technique is described and illustrated in the book recently published, "Step Technique for Opening the Bite," by C. F. Franzwa, D.D.S.

With the Vitallium appliances in place, the correct relation of the upper anterior teeth to the lower is clearly portrayed. Right and left lateral excursions and anterior and posterior movements were permitted by this type of occlusal construction. Without cuspal interferences, the lower arch could protrude to its normal position after proper vertical dimensions had been established. The construction of the Vitallium appliances is of the treatment-type. After the treatment period, natural cusp forms will be added.



Because a vertical and also a horizontal correction had to be made, it was necessary to design an occlusion that would permit the lower jaw to move forward without interference. Serrated ridges which occlude in opposite relation permit the lower arch to reassume its normal relation to the upper arch. The photograph shows the completed cases in place.

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each man in his work-a-day world adds to its sustaining strength. Each of us must consciously ask himself: What would Democracy's destruction mean to the people I know and like? What would happen to my colleagues; to my associates; my friends; my family; yes, even to those I don't like but wish no evil; to me? What would its loss do to my rising in the morning and my going to bed at night? What would happen to what I eat and drink; to the books I read; the radio programs I now listen to; the conversations I enjoy; to the way I have been taught to practice dentistry; to my patients; to those for whom we are now concerned with making dental care available; to the freedom of expression in this magazine? These pleasures I have do not come freely, if at all, to the citizens of a totalitarian state. What does it mean to you and to me not to fear the secret police or the Gestapo? What does it mean to associate with whomever we choose, unafraid and proudly; to speak our minds and voice our differences without lurking informers to strike us mute; to know no restrictions of food rationing cards; to feel warm and see daylight and not have to listen for all-clear signals.

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Did you know that Doctor Adams, an oral surgeon from Irwin, Pa., invented the air mail pickup device shown in photo above? Readers everywhere will be interested in this invention of a fellow practitioner.

Dental Reciprocity Analyzed and Practical Dental Examination Required (see pages 168-169-170-171) show in chart form valuable information that you will want to keep for your reference file. DON'T MISS THIS FEATURE.

The Malignant Art of Eyebrow Shrugging — a title that almost speaks for itself. Doctor Bregstein believes "Gossip is a crude method employed by neurotics to bolster their own egos." We know you will agree with him.

Doctor George E. Payne Philpots, an Australian dentist, tells how the war-time plans of his country protect dental practices. This is timely information of interest to many U.S. practitioners now.

Does the technique of colloidal impression for fixed bridge work trouble you? (Doctors Craig and Cuden suggest a technique in picture-writing—13 pictures—see pages 188-189.)

This month's editorial features relief for the British dentists. Also there are four pages of Dear Oral Hygiene (many interesting comments on the hygienist problem—see October, 1940, O.H.); three pages of Dentists in the News; and six pages in the ever-popular Ask Oral Hygiene department.

Oral Hygiene

FOR FEBRUARY

burning and possibly incur "trial for treason" to their owners for having possessed them. Here there were no intellectual blackouts, no curfews tolling against human dignity. Food and drink were to be had to suit the good taste of the guests and the plans of the host. Men and women were there of many vocations. Judges present were from the two major political parties. No one hesitated to express himself on any subject he chose. No one stole glances at the chap next to him in fear that he might be a secret agent. Conversation was not hushed at the entrance of servants who might be informers. There were no heel-clickers or Heil-raisers. Everyone was himself, acted naturally, came and went as and when he wished without regulations or regimentation. No one had to falsify his ancestry, deny his religion, submerge his political beliefs. It was the gracious living now possible only where democracy functions in American society.

There isn't one of us who doesn't have similar experiences every day. That is what makes up the substance and essence of our lives. What are we doing, what contributions are we making to Democracy, each of us in our individual spheres of influence and action to preserve this? We talk nobly and heroically about *dying* to preserve our way of life. But how are we *living* to maintain this American Democracy?

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You can't associate long with radio people, with advertising copy writers, photographers, editors, or interior decorators without having your ears parched with the "dramatic." Get a dramatic program; throw the flowers in a vase in a dramatic fashion; get a dramatic appeal; a dramatic masthead on the front page. No one wants us to have any calm and peace any more. Everyone and everything has to be moving in swift action and motionless things must seem to be breaking loose from their static states. I am going to toss the word "dramatic" out in the ash can along with "contact" and "conference" and "outstanding," which are likewise jargons of the world of fury which I do not like. Drama belongs on the stage. Let's give the dramatic back to the actors from whom it was usurped.

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dental journalism is Harry Garvin of the *Journal of the Canadian Dental Association*. A fine example of his power and clear-cut thinking is the editorial, "The Enemy of the Good," published in the January issue of his magazine, generous excerpts of which are herewith given:

"Walter B. Pitkin, author of 'Life Begins at 40' . . . describes a Detroit school teacher of the '90's as saying: 'I am the Enemy of the Good. I am not joking. I do not like good students. I like only the best. I do not like a good translation. I like only the right translation. You either know something, or you don't know it. You either can do a thing, or you can't.'

"Pitkin goes on to say that everyone, at least once, ought to fall under the spell of a fanatical perfectionist and that only then can the common man come to realize his own astounding possibilities, that to understand that it is possible to hate half-knowledge, half-skills, half-hearted ideals, sets fire to something inside you. He further says, You can't make people perfect, or the world perfect, they object, but men, by trying to perfect themselves, their businesses and their government, may make all these ten times better than they are now.

"As we commence another year of practice, could we not imbibe, as a profession, some of the ideals suggested in the above quotation? There are some who feel, and I believe wrongly, that they have to cut fees in order to meet competition, and this leads to indifferent work. There are some who work at such low fees that they have to work early and late in order to survive, with the result that there is no time for study, for self-analysis or for working out plans for general advancement. Some of the older men have seen their practices gradually fall away and have given as an excuse every reason except the right one.

"There are many who have not mastered the art of dental practice, and may see leaner days in the future unless certain adjustments are made, even though at the present time they may be enjoying the satisfaction of a crowded appointment book. It is not enough to have unusual technical skill. The dentist must know how to apply his scientific knowledge if he is to succeed. He must be endowed with a manner that inspires confidence; if not, he must study to acquire it. He must be dignified. He must study psychology in order to know how to deal with various types of patients, every one being a problem unto himself. The dentist's knowledge of human nature should be profound. He must recognize the intellectual, the nervous, the fearful, the shy, the erratic and the ignorant type of individual and be able to meet these patients with methods suitable to each class.

"The modern dentist should master the English language, and also English composition, so that he can meet his patients properly and write to them correctly. President Elliot of Harvard University, once said, 'I recognize but one acquisition as an essential part of the education of a lady and a gentleman—namely, an accurate and refined use of the mother tongue.'" Worthwhile patients expect this characteristic in their dentist and physician. We must be well-equipped dentists, not merely technicians.

"There is undoubtedly more to the practice of dentistry than technical skill but technical ability is an essential and in this respect we would be virtually 'the Enemy of the Good,' should we be satisfied with anything short of perfection.

"Organized dentistry could do much to stimulate a finer type of practice. Men should be appointed to devote their whole time to working on these problems of practice. Surveys could be made. Experimental tests could be carried out in certain districts. A consultation service could be maintained. An intensified study could be made of our various problems. All would benefit and the public, most of all. It should be pointed out, however, that all this cannot be accomplished on the basis of a few cents a month membership fee. . .

" 'God calls a man to be upright and pure and generous, but he also calls him to be intelligent and skilful and strong and brave. The world wants a man who is educated all over; whose nerves are brought to their acutest sensibility; whose brain is cultured, keen, incisive, penetrating, broad, liberal, deep; whose hands are deft; whose eyes are alert, sensitive, microscopic; whose heart is tender, broad, magnanimous, true. Every profession and every occupation has a standing

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